THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1347.] LONDON, MARCH 5, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Warranted Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"
As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 455.

CEMENT
EARLE'S
BEST
PORTLAND CEMENT
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
PROMPT DESPATCH:
Seven Jetties on the River.
Two Private Railway Sidings.
FACILITIES FOR DESPATCH:
Six Railway-Waggon Entrances with Steam and Hydraulic Cranes.
Four Rully Entrances.
Three different Railway Companies within easy cartage distance.
Storage Capacity 8000 tons.
Office: 7, PIER STREET.
Works: WILMINGTON.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

"Abyssinian" Tube Wells.
Pure Water Supplies
LE GRAND & SUTCLIFF,
100, BUNHILL ROW,
LONDON.

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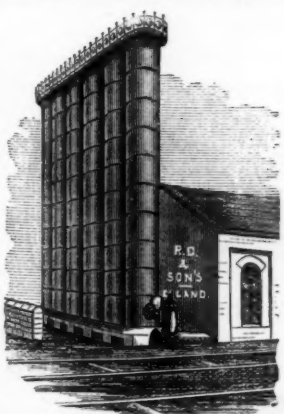
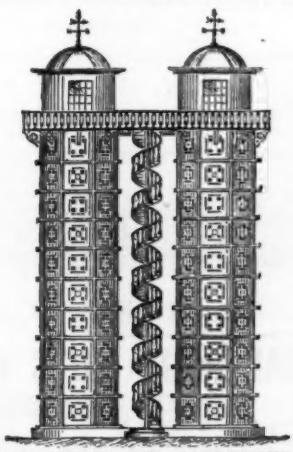
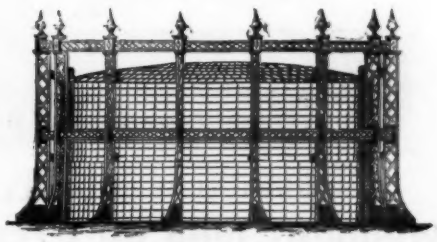
ELLAND, YORKS.,
MANUFACTURERS and CONTRACTORS for EVERY DESCRIPTION of GAS and CHEMICAL PLANT.



WROUGHT-IRON ANNULAR AND HORIZONTAL CONDENSERS.
Thoroughly effective.
Improved Construction.


SCRUBBERS ANY DIMENSIONS.
OURS continue to give the BEST RESULTS.

ESTIMATES, SPECIFICATIONS, & ILLUSTRATIONS ON APPLICATION.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OF EVERY DESCRIPTION AND SIZE.

Makers of Livesey's Patent Washers for the Colonies and Abroad.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

EDWARD COCKEY & SONS, LTD.,

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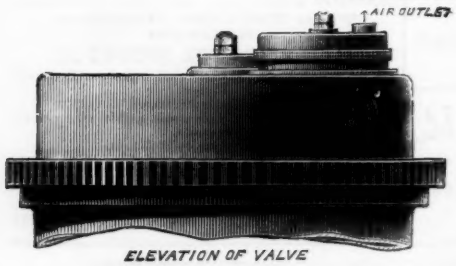
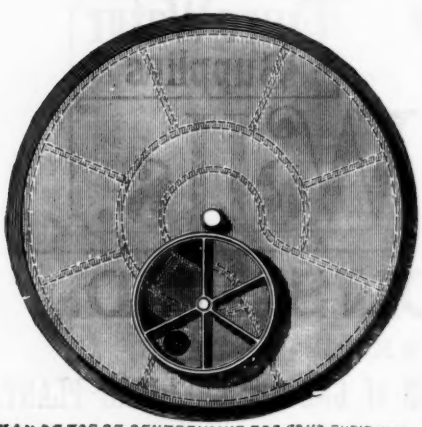
SULPHATE & LIQUID AMMONIA PLANTS.



ELEVATION OF VALVE



PLAN OF TOP OF CENTRE VALVE FOR FOUR PURIFIERS

Wood Grids for Purifiers. / Wood Boards for Scrubbers. / Cast-Iron Main Pipes and Connections. / Station Meters. / Governors. / Valves of every description. / Brass Fittings. / Lamp Columns. / Boilers. / Weighbridges. / Coke Breakers. / &c., &c.

Patent Washers with improved Overflow Arrangements, requiring no Motive Power, and giving unexcelled results.

PATENT SELF-ACTING BYE-PASS VALVES FOR EXHAUSTING APPARATUS.

Patent Centre-Valves, working all Four Purifiers in a Set, or Three, Two, or One, in Rotation.

PATENT FOUR-WAY BYE-PASS VALVES.

PATENT AIR-CLEARING VALVES FOR WORKING IN CONNECTION WITH CENTRE-VALVES.

The illustration shows one of our new Patent Air-Clearing Valves as fixed on the Cover of a Centre-Valve. When in action, the clean gas from the Outlet Chamber of the Valve is passed down the Outlet-Box of the Purifier last changed, and forced through the Inlet into the Air-Clearing Valve, from which a proper outlet is provided on the top, leaving the Purifier ready charged with clean gas in place of air, as is usual; thus preventing the spoiling or wasting of a large quantity of gas.

Many of these Valves have been fixed, and are giving every satisfaction.

TESTIMONIALS ON APPLICATION.

Drawings, Specifications, and Estimates for Apparatus (and the necessary Buildings and Tanks if desired) furnished on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

Telegraphic Address: "COCKEYS, FROME." INQUIRIES INVITED.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

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MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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THOMAS PIGGOTT & CO.,

(ESTABLISHED 1822)

SPRING HILL, BIRMINGHAM,

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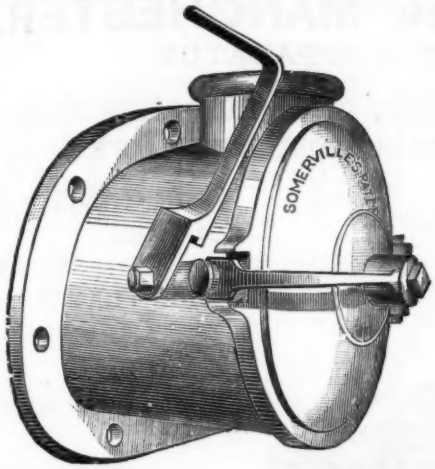

GASHOLDERS AND GAS APPARATUS,

INCLUDING

RETORTS AND FITTINGS, PURIFIERS, VALVES, PIPING SCRUBBERS, CONDENSERS, WASHERS, &c., &c., &c.;

GASHOLDER TANKS IN CAST AND WROUGHT IRON;

GOLIATH, HYDRAULIC, AND OTHER PURIFIER COVER LIFTS,

ALL OF THE MOST APPROVED DESIGNS.

BOILERS, ENGINES, PUMPS, EXHAUSTERS, METERS, GOVERNORS, &c.

SULPHATE OF AMMONIA PLANT.

MAKERS OF

SOMERVILLE'S PATENT RETORT MOUTHPIECES & LIDS,

WHICH ARE SELF-SEALING AND REQUIRE NO LUTING.

Prices and further Particulars may be obtained on application.

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ESTABLISHED 1825.

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FOR ANY PURPOSE.

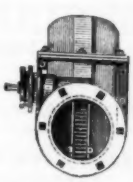
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION,
or
Internal or External
SCREWS, of all Sizes.

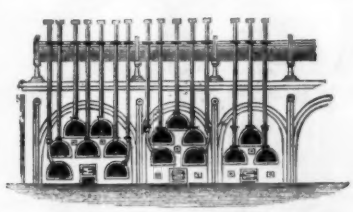
GASHOLDERS,
AND
Gasholder Tanks.



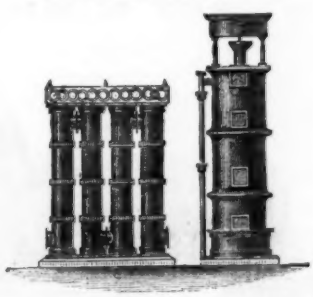
CAST-IRON RETORTS,

RETORT-BED FITTINGS,
AND RETORT-HOUSE APPLIANCES
of every description.

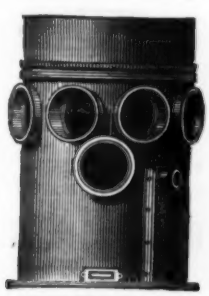
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS
TAR AND LIQUOR PUMPS, &c.



PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.



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HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

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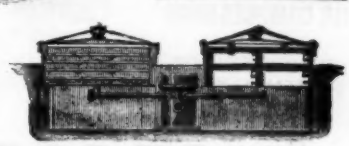

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GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

MANUFACTURERS and ERECTORS of APPARATUS FOR THE

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GIRDERS,
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ASCENSIONS,
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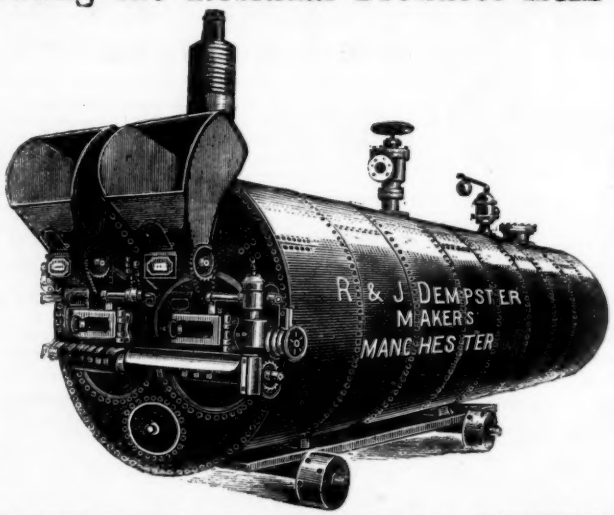
FOUL MAINS,
CONDENSERS,
BOILERS,
GASHOLDERS,
TANKS,
STILLS,
SERVICES.



CAST-IRON
COLUMNS,
BEAMS,
FLOOR PLATES,
RETORTS,
FITTINGS,
BRACKETS,
WASHERS,
SCRUBBERS,
PURIFIERS,
VALVES,
TANKS,
MAINS,
LAMP-POSTS.

ALL KINDS OF CONSTRUCTIONAL IRONWORK.

ESTIMATES, WITH SPECIFICATIONS AND ILLUSTRATIONS, FURNISHED UPON APPLICATION.

LONDON OFFICES: 181 and 182, GRESHAM HOUSE, OLD BROAD STREET, E.C.

Telegraphic Addresses: "SCRUBBER MANCHESTER" and "SCRUBBER LONDON."

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STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description

GLAZED BRICKS AND PORCELAIN BATHS.

CROSSLEY'S "OTTO" GAS-ENGINE.

MADE in SIZES
2 Man to 100 HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SCHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

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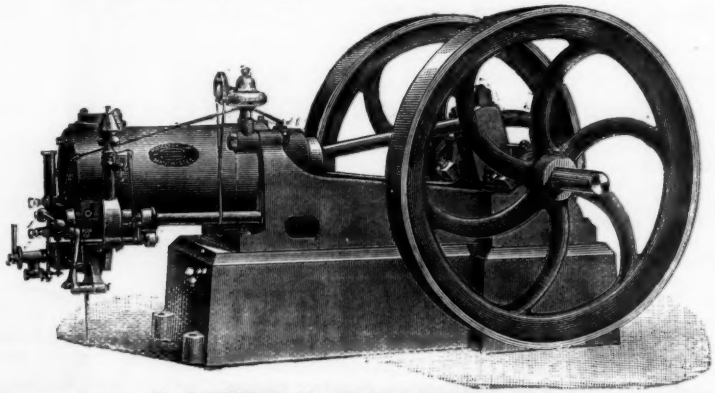
NEW 14 H.P. NOMINAL SIZE.



MADE in SIZES
2 Man to 100 HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c., &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over 27,000 "OTTO" ENGINES have now been made.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

59 and 60, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, LONDON, S.W.

Managing Director—Mr. SIDNEY HERSEY.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION

AND THE

EXTRACTION OF AMMONIA FROM GASES

FROM COKE-OVENS AND BLAST-FURNACES.

AT THE PRESENT DATE

351 Patent "STANDARD" WASHER-SCRUBBERS

EQUAL TO A

Daily Capacity of 306,600,000 Cubic Feet of Gas,

HAVE BEEN ORDERED, AND THOSE IN OPERATION

ARE

GIVING UNIVERSAL SATISFACTION.

The Gaslight and Coke Company,

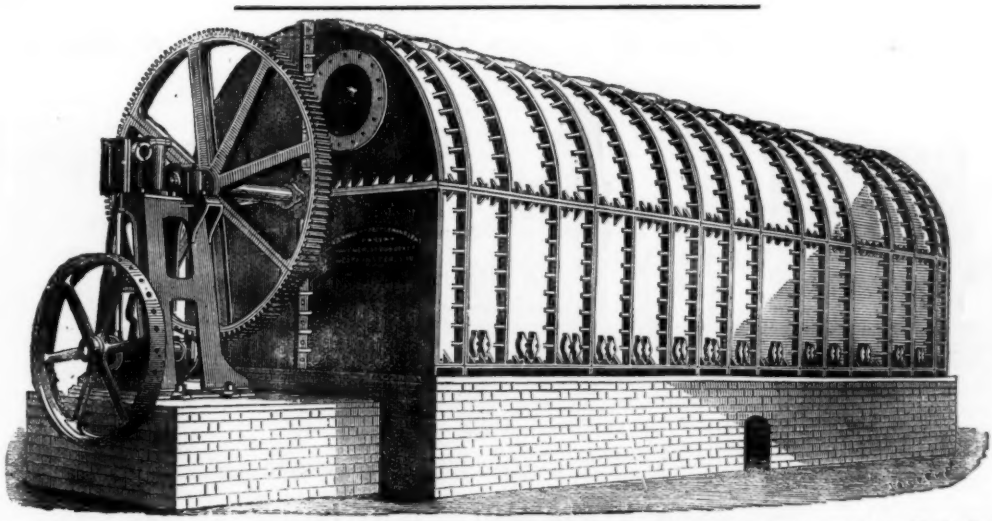
SIDNEY HERSEY, Esq., Secretary.
KIRKHAM, HULETT, AND CHANDLER, Limited.

Horseferry Road, Westminster, S.W.,
May 27, 1887.

Dear Sir,—In reply to your letter of yesterday's date, I beg to say that the Washer-Scrubbers that you have supplied us with at our several Works continue to give every satisfaction.—I remain, yours truly,

(Signed) G. C. TREWBY.

Testimonials as to Efficiency are too numerous for publication, but can be had on application at the Company's Offices.



This engraving represents one of the four "Standards," for 3,000,000 feet each, erected for the Corporation of Leeds, and now in use at the New Wortley Station;

A Machine of same pattern, but for 2,000,000 feet, has also been put in operation at their York Street Station.

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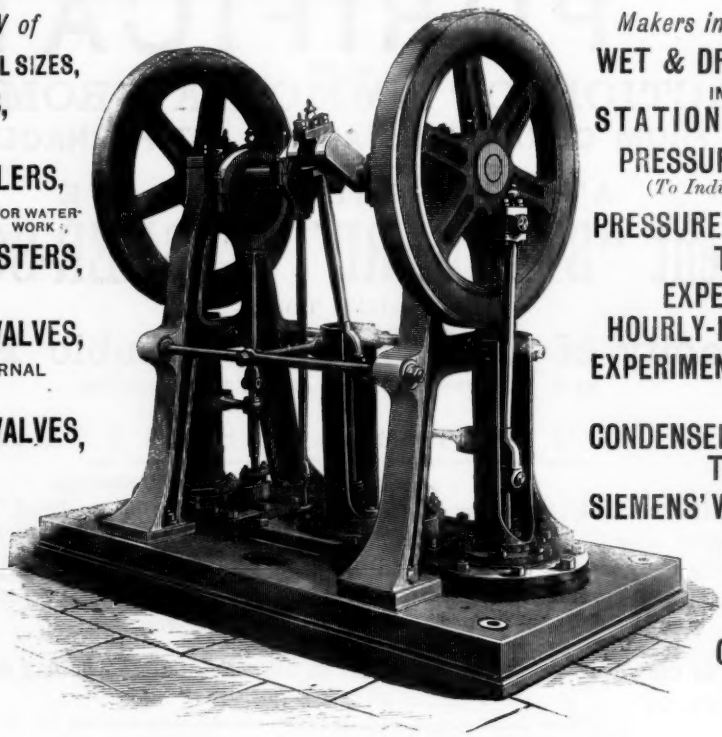
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



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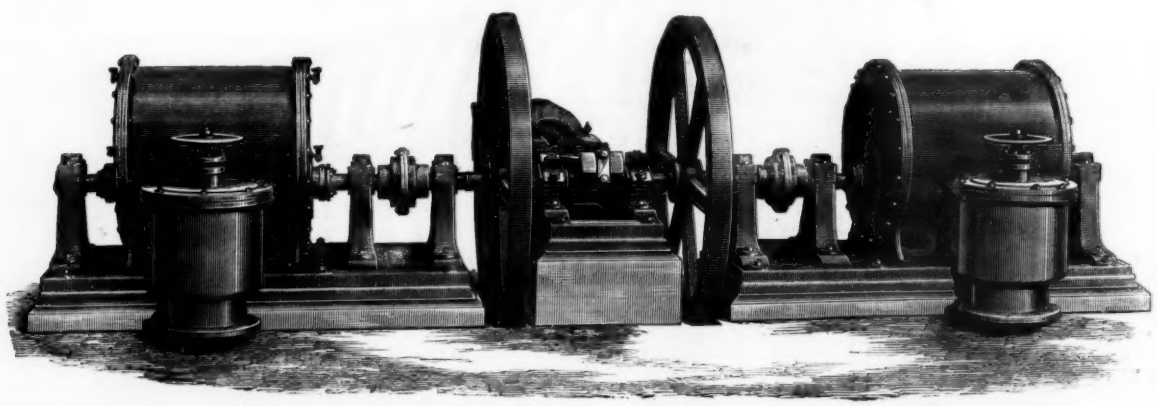
WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS
(To Indicate New Time),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of
GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

MORTON'S SELF-SEALING RETORT-LID

WITH

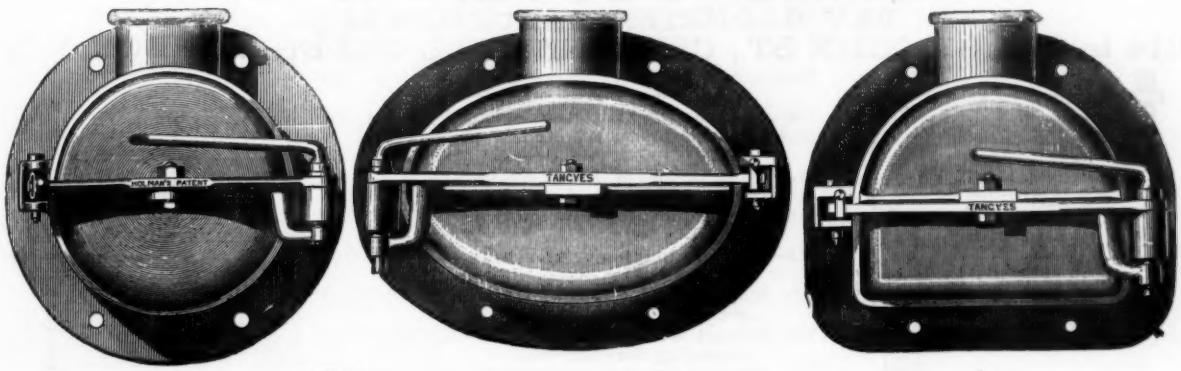
HOLMAN'S ANTI-FRICTION CATCH AND SELF-SUSTAINING CROSS-BAR

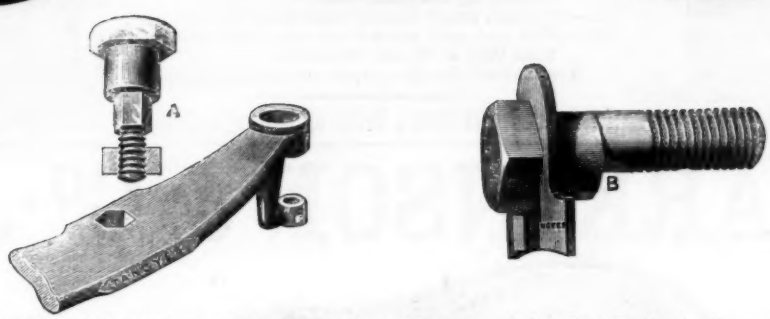
AND

CARPENTER'S PATENT FASTENING.

TANGYES LIMITED SOLE MAKERS.

All Retort-Lids and Fastenings supplied by TANGYES LIMITED are now fitted with Carpenter's Patent Fastening, free of extra charge.





The above Retort-Lids and Fastenings—extensively adopted in most of the Gas-Works in Great Britain, America, and on the Continent, and which have almost entirely displaced the older method of sealing by a luting of lime or other material—are now fitted, free of extra charge, with CARPENTER'S PATENT FASTENING, FOR OBVIATING THE TROUBLE DUE TO SLIPPING BACK OF THE ORDINARY MID ECCENTRIC ADJUSTING BOLT, each time the lid is slacked. It ensures a perfectly tight joint between the lid and mouthpiece; and thus prevents all leakage of gas and tar.

April 7, 1886.

"The best answer I can give to your inquiry as to my opinion of your HEXAGONAL ECCENTRIC BOLT, as applied to the fastening of Morton's Lids, is to say that it is so much approved, that to-day the order has been given for the Lids for the Retorts of the Company's New Works, at East Greenwich, which are all to be fitted with the Bolt in question.

"Yours faithfully, (Signed) "GEORGE LIVESEY."

The CARPENTER PATENT FASTENING is easily substituted for the old kind in use on existing Lids, and many hundreds of Mouthpieces so fitted are now working with entire satisfaction; they give no trouble, and are quite gas-tight.

TANGYES LIMITED,

CORNWALL WORKS, BIRMINGHAM.

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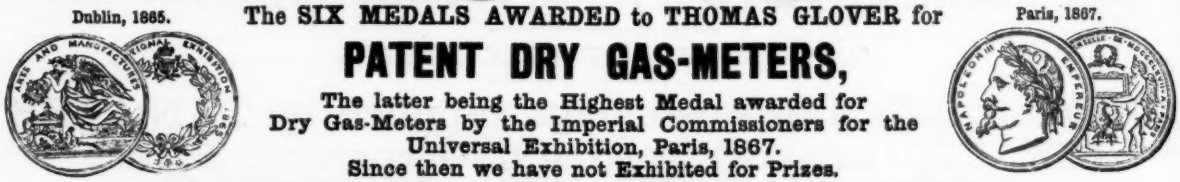
MANCHESTER: Deansgate.
GLASGOW: Argyle Street.
PARIS: Place de la Republique.
SYDNEY: 119, Bathurst Street.
MELBOURNE: Collins Street West.

Established 1844.] **ORIGINAL MAKERS.** [Established 1844.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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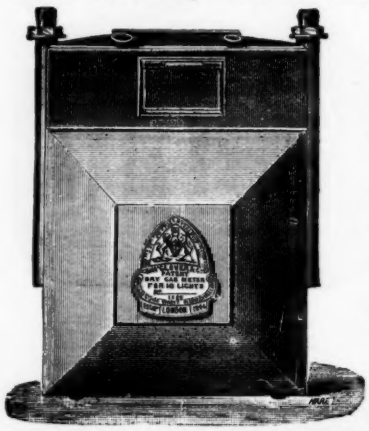

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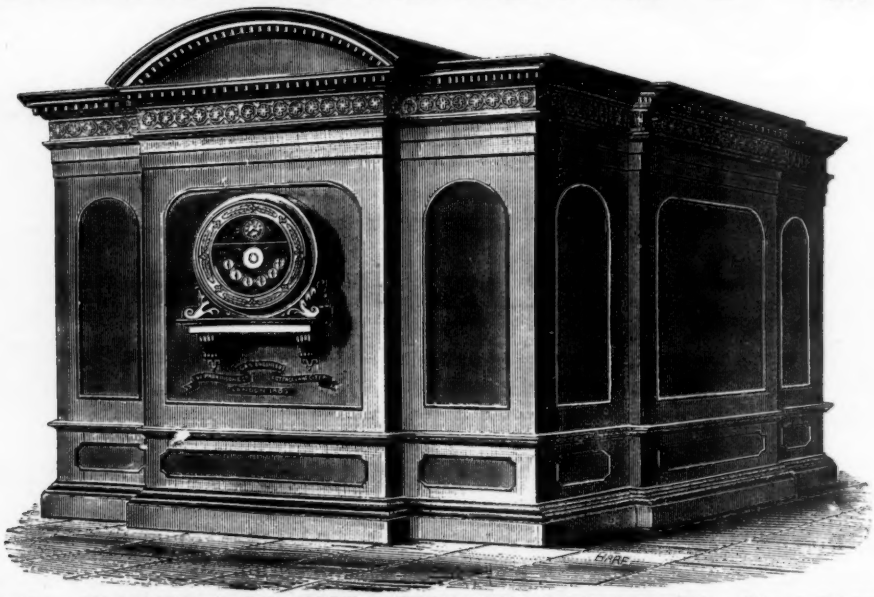

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CONTENTS.

EDITORIAL NOTES—*Gas, Lighting, &c.*:— PAGE
Engineers and Gasholder Design . . . 425
Gas Testing in London . . . 425
Gas Affairs in Birmingham . . . 426
Mr. T. Banbury Ball's Address . . . 426
The Exhaustion of the Coal-Fields . . . 426
ESSAYS, COMMENTARIES, AND REVIEWS:—
The Affairs of The Gas Institute . . . 427
Gas and Water Companies in the Stock Market . . . 427
Electric Lighting Memoranda . . . 428
Gas Testing and Standards of Light . . . 428
Death of Mr. Lewis Thompson . . . 429
The Relation of Water Supply and Disease . . . 430
NOTES:—
Mr. B. Baker on the Wind Pressure at the Forth Bridge . . . 431
Spiral Welded Tubes . . . 431
Grease in Steam-Boilers . . . 431
TECHNICAL RECORD:—
Manchester District Institution of Gas Engineers—Annual Meeting—Inaugural Address of Mr. T. B. Ball . . . 432
The Construction of Gasholder Tanks. Paper read by Mr. C. Hunt, M. Inst. C.E., before the Association of Birmingham Students of the Institution of Civil Engineers . . . 434
REGISTER OF PATENTS:—
Regenerative Gas-Lamp—Fullford, E., and Laun, H. T. van . . . 436
Tar-Burner—Burtonshaw, T. . . . 436
Treating Ammoniacal Liquor—Green, H. . . . 437
Flushing Cisterns—Cowan, W. and W. H. . . . 437
Patent Notices . . . 437
CORRESPONDENCE:—
The Position of The Gas Institute . . . 438
The Dinsmore Process . . . 438
Designing Gasholders . . . 438
The Specific Gravity and Illuminating Power of Gas . . . 439
PARLIAMENTARY INTELLIGENCE:—
House of Lords—Progress of Bills . . . 439
House of Commons—Bills and their Introducers; Progress of Bills; Metropolis Water Supply; Weights and Measures; Private Bill Legislation; Lighthouse Illuminants . . . 439
LEGAL INTELLIGENCE:—
Supreme Court of Judicature—Court of Appeal—*In re* An Arbitration between the Yeadon Local Board and the Yeadon Water-Works Company . . . 440
Greenwich Police Court—Conviction for Stealing Gas . . . 440
MISCELLANEOUS NEWS:—
The Board of Trade Report on the Gas, &c., Bills and Orders of the Present Session . . . 441
The Proposed Electric Lighting Experiment in the City of London . . . 441
Provincial Gas and Water Companies . . . 442
Meeting of the Tottenham and Edmonton Gas Company . . . 443
Meeting of the Dinsmore Gas Company, Limited . . . 443
Meeting of the Woking Water and Gas Company . . . 444
Meeting of the City of St. Petersburg New Water-Works Company, Limited . . . 444
Meeting of the Colne Valley Water Company . . . 445
Salford Corporation Gas Supply—The Proposed Draft upon the Depreciation Fund . . . 445
The Metropolitan Board of Works and the Gas and Water Supply of the Metropolis . . . 445
Proposed Augmentation of the Water Supply of Edinburgh . . . 447
Proposed Purchase of the Mansfield Water-Works by the Improvement Commissioners . . . 447
Notes from Scotland . . . 448
Gas and Water Companies' Stock and Share List . . . 448
Current Sales of Gas Products . . . 449
The Manager of the Colchester Gas-Works, 427—The London County Council and the Gas and Water Undertakings, 427—The London Coal and Wine Dues, 427—A Proposed Fire-Brick Syndicate, 431—Presentations to Mr. D. M'Minn and Mr. J. G. Frisken, of Fulham, 431—The Late Mr. S. P. Leather, 431—South-West of England District Association of Gas Managers, 436—Tenby Water Supply, 439—Improved Lighting at Exeter, 439—Proposed New Water-Works for Stainland, 439—South Essex Water Company, 439—The Management of the Saltley (Birmingham) Gas-Works, 439—The Rastrick Local Board and the Water Company's Bill, 440—The Price of Gas at Harwich, 440—Northern Coal Trade, 440—Liverpool Corporation Water Affairs, 440—The Fatal Accident at the Swansea Gas-Works, 440—The Public Lighting of Bromley, 447—Proposed Purchase of the Welshpool Gas-Works by the Corporation, 447—Sale of Shares in the Elland Gas Company, 448—Reductions in Price, 448.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that **Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.**

Telegraphic Address: "GASKING LONDON."

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 5, 1889.

ENGINEERS AND GASHOLDER DESIGN.

A CORRESPONDENT has something to say in another column respecting our recently-published criticism of Messrs. Walker's gasholder articles, with special reference to the position we took up on the question whether designs of gas-works plant should be left to contractors or obtained from independent consulting engineers. He agrees with us in the main, but, as he says, for different reasons. It may be thought that when two people arrive at the same conclusion with regard to any matter, the fact of the agreement is very much more important than the diversity of the ways by which it is attained. Yet it is always interesting to hear how different people, starting from independent points, come to the same end; and the subject under discussion is of such importance that we are disposed to give all possible prominence to every argument tending to add weight to the conclusion which we regard as the right one. Gas engineering occupies a position midway between civil and mechanical engineering; and a good deal hangs from this circumstance. Nobody thinks of applying to a contractor, though he be as eminent in his business as Mr. Brassey was in his day, for designs of the railways on which he is to be engaged. It is recognized that the contractor's functions are altogether distinct from those of the engineer. In mechanical engineering, on the other hand, the contractor or manufacturer is generally the designer of the tools and machines which he sells. A purchaser of a crane or a lathe is commonly content to state his requirements, and leave to the maker the responsibility for the structural details. Much of the plant needed in gas-works is of an order that may be classed with machinery and tools, and as such may be safely bought out of a maker's catalogue. There is no immediate question of design in this kind of plant. All the designing that is necessary was done long ago—types and patterns being settled by tradition and experience upon lines that nobody finds it worth while to disturb. Some kinds of plant, again, occupy a border-land in which stock patterns, although available to a certain extent, are liable to be upset by the purchasers' individual tastes and requirements. Still the question of design does not attain any great importance, for one pattern is practically as good as another. Then we come to the gas-making plant, which requires to be dealt with according to the methods of civil engineering; and gasholders and their tanks fall naturally into this category. We have argued that since a designer cannot be dispensed with for work of this kind, it is better on all accounts for him to be independent, and directly responsible to the purchaser, than to be hidden away upon the contractor's premises. We have not pretended, in the article to which our correspondent refers, to give all the reasons for this conclusion—the question answers itself; but if a detailed argument is required, we can advance other considerations in support of our conclusion, some having regard to the interest of the contractor as well as to that of the purchaser. If, for instance, a manager of a gas-works cannot or will not design a holder as he wants it, and objects to calling in the aid of a consulting engineer, he is very likely to apply for designs and estimates to (say) half-a-dozen reliable firms of constructors. This request entails a visit to the site, or at least some correspondence and inquiry, and the preparation of drawings on the part of all six competitors for the job. Five out of the six must waste their labour, whereas possibly any of them could have done better for the purchaser than the successful one, whose design or price, or other almost accidental recommendation, happens to strike the customer's fancy, if they had only known exactly what was wanted. Mechanical engineers complain bitterly of the same thing. They are often asked to tender for engines, pumps, &c., in almost utter ignorance of what is really wanted; and after they have offered what they imagine the customer ought to have, they are annoyed to discern that somebody else has secured the order—not because his goods are either better or cheaper, but because he has happened to hit the unknown mark of the purchaser's fancy. In the same way we might enlarge upon the subject; but enough has been said. As our correspondent remarks, gas companies ought to employ men as works managers who have good general engineering knowledge; but the question of expense comes in, and draws the line below which small concerns may be well content with a working manager who is no engineer. There are scores of such undertakings throughout the country, which are not only small, but have no prospect of growing bigger. An engineer with ability to make designs for plant would only eat his heart out in such a place, and if compelled to remain would be liable to rust for want of use. It is far better for the owners of this order of undertakings to call in a consulting engineer for the rare occasions when they want anything new. Works which grow rapidly, or are large enough to keep an engineer employed, should undoubtedly have the advantage of one resident and in charge, as we have repeatedly urged.

GAS TESTING IN LONDON.

SOMEBODY behind the scenes has been stirring up the London newspapers upon the subject of the iniquitous conduct of the Metropolitan Gas Companies in the matter of sending out gas below the parliamentary standard of illuminating power; and if the newspaper-reading public had not been

fully occupied of late with more exciting topics, it is just possible that a little breeze of popular feeling might have sprung up to help the Board of Trade forward with their gas-testing reforms. Nobody thinks much of gas half-a-candle under the standard, however, while the electric lamps of the Law Courts are twinkling upon as exciting a politico-legal drama as any that has been played out in our time. It is just as well that this question of gas-testing should be left to be settled dispassionately; for injustice would be sure to follow upon "agitation," if such were the consequence of rabid newspaper comments on the subject. In reality there is not the slightest excuse for violent writing upon this matter, for all parties are agreed as to the necessity for reform. While the Gas Companies are quite prepared to meet the Board of Trade and the Local Authorities for the settlement of gas-testing upon a reasonable basis, however, they will strenuously defend themselves against all attempts aimed at taking them at an unfair advantage—such, for example, as that of the Metropolitan Board of Works when it was sought to legalize the perambulating photometer. The Metropolitan Board never could be fair to the Gas Companies, however; and therefore it is useless to blame them for not seeing in the portable photometer anything unsatisfactory to the Companies. If the promised action of the Board of Trade has not been instigated by the Metropolitan Board or the Referees, it may be taken for granted, from what has passed before, that at the first sound of an alteration of the arrangements for testing London gas, the Board will have pricked up their ears and thought of taking advantage of the opportunity for dragging in, by hook or by crook, their pet wheelbarrow photometer. It would soothe the dying hours of the Board if they could manage to give such a parting kick to the Gas Companies whom they have worried all their days. There is more sense of fair play at the Board of Trade than was ever to be found at Spring Gardens, however; and therefore if any attempt be made to smuggle in the portable photometer, it should be easily defeated.

GAS AFFAIRS IN BIRMINGHAM.

The fountains of the great deep have been broken up by the question of the Saltley administration; and all sorts of complaints and allegations are being made respecting the policy and proceedings of the Birmingham Corporation Gas Department. One of the local newspapers has laid itself out to make a case against the Gas Committee; but the evidence collected so far is not of a very substantial order. If the bulk of the complaints against the Committee mean anything at all, they refer more to the fittings branch of their operations than to any other. The usual indictment has been prepared by the gas-fitters of the town—the trade ruined by competition, public money wasted, &c., just as in other places where gas-fitting is undertaken by the Gas Company or the Corporation. There is very little substance in this grievance. It is notorious that scarcely any trade in gas-stoves exists where the shopkeepers are the only sources whence these articles can be obtained. With regard to general gas-fitting, moreover, he must be a poor tradesman who, working for his own profit, cannot compete with an official department. What gas-fittings departments of Gas Committees and Gas Companies have really done has been to set up a better standard for such work than previously prevailed, and so help good workmen by exhibiting cheap and nasty jobs in their true light. Besides this, they have clipped the profits of the old style of gas-fitters, who conducted their business upon conventional principles, and charged heavily for everything they supplied. There has not been more irrational and exorbitant charging in any trade than in gas-fitting by the good old-fashioned firms who divided between them the best custom of the chief towns. Among these old-established shopkeepers the starting of a public gas-fitting department to supply good work at reasonable prices is like the invasion of a sleepy old town by the terrible "stores." Common cause is made against the new-comer; and the respectable old traders whose reign is disputed display unsuspected powers of vilification in defence of their preserves. Besides the complaint of the gas-fitters, however, the present agitation of the gas question in Birmingham affords an opportunity for the ventilation of several grievances against the Committee. Among others, the subject of keeping up the price of gas in order to subsidize the rates is brought forward for debate; and some telling things are advanced against the policy of the Corporation. A writer to the local newspapers roundly declares that "there are thousands of "large ratepayers in Birmingham and suburbs who burn "very little gas, using oil-lamps, &c. Is it just for us to be "charged a high rate for gas to not only reduce our own "rates, but also the rates of the non-consumers?" To this query we have only one reply. It certainly is not just for gas consumers to be taxed for such a purpose; but it is the custom of Birmingham, and will probably continue to be a ruling principle with the Corporation until the town councillors as a body awaken to more correct views respecting indirect taxation. It is a pity to mix up such a correct issue as this of the surtaxing of gas consumers, with the stupid clamour against the Corporation Gas-Fittings Department; but as it is a general rule that few popular outbreaks are without some limited or incidental reason, so the present half-factitious agitation is the means of bringing into prominence some matters in regard to which the Birmingham Corporation are pursuing a mistaken policy.

MR. T. BANBURY BALL'S ADDRESS.

The Manchester District Institution met on Saturday last, when the President (Mr. T. Banbury Ball, of Rochdale) delivered a most interesting Inaugural Address, which will be found in another column. It is the amiable rule to be forbearing always, and complimentary if possible, with regard to these conventional compositions; but we have no hesitation in saying that it is for no such consideration that Mr. Ball's address is to be described as thoroughly well worth reading. He arrests attention by a happily-worded introductory paragraph, and holds it afterwards by virtue of the luminous good sense of his remarks. The more inaugural addresses one reads, the more certain it appears that the successful composition of this class of literary exercises is a "knack" which seems to come more naturally to some men than it does to others. It takes a clever man to produce a good presidential address; but not every clever man in the position succeeds in this part of his duties. A president is expected to be frankly personal in his disclosures of professional experiences; and yet he must not be vainglorious. Some presidents hit the happy mean without apparent effort; and Mr. Ball is one of this fortunate band. There is a good deal in his address which calls for detailed comment, especially in these columns; but we cannot criticize Mr. Ball at length. In the very beginning of his remarks, when dealing with the competition of electricity with gas, he questions the view taken by us of the harmless influence of electric lighting upon gas consumption, and argues that every thousand cubic feet of gas displaced by electricity must mean a certain loss of profit to gas shareholders. It appears, however, that Mr. Ball herein ignores the most striking fact in the case—that even if electricity displaces gas in some establishments, it exerts a more than countervailing influence, by so fostering the desire for brilliant lighting that neighbouring establishments are led to burn more gas than ever. We have on a previous occasion crossed swords with Mr. Ball over the desirability of extending the cottage consumption of gas; and he returns to the charge in his address. The fact is, however, that in Rochdale gas is already popularized to an extent that a gas manager situated (say) as Mr. Valon is would regard as quite sufficient. Mr. Ball's observations upon the subject consequently require to be read with reference to the lowness of his datum. It is satisfactory to find that Mr. Ball has the courage of his convictions with regard to the wrongfulness of subsidizing town rates out of gas profits. Altogether, the address is very creditable to the author, and quite bears out the expectations which Mr. Ball's previous reputation had aroused.

THE EXHAUSTION OF THE COAL-FIELDS.

An attempt has been made by Mr. R. Price Williams, in the form of a paper read before the Statistical Society, to raise once more the alarm of a rapid exhaustion of our native coal supplies which created such a sensation when it was first started by the late Professor Stanley Jevons. According to the author's conclusions, which were given in the last issue of the Journal, all the coal deposits of the United Kingdom will be worked out within a short date; the most valuable in considerably less than a century from the present time. This is a terrible prospect for the country; and Corporations owning gas undertakings may be expected to set about extinguishing their capital indebtedness on this account within the shortest possible time, in order that their successors may not be burdened with liabilities for which there will be no useful assets. If we are to believe Mr. Price Williams when he says that there will be no more coal in Northumberland or Durham in 94 years' time, that Yorkshire, Derbyshire, and Nottinghamshire will be exhausted in

90 years, and Lancashire and Cheshire in 74 years, then the sooner the numerous Corporations in these districts who possess gas-works stop paying rates out of profits, and apply their balances to wiping off capital, the better. The question is, however, whether Mr. Price Williams himself really believes in the exhaustion of the British coal deposits within the early dates given in his paper. Frankly, we take it that he has put these results forward as the consequence of a certain method of computation, without wholly committing himself to the soundness of that method. Professor Jevons raised a great "scare;" but it was very quickly perceived that his prediction of the speedy exhaustion of the coal measures depended upon the assumption that a progressive output would necessarily continue to progress at the same ratio as that established by observations ranging over a very few years. It was demonstrated, moreover, that, upon Professor Jevons's showing, every man, woman, and child in the land would be engaged in the coal-mining industry a long time before the maximum output contemplated by him could be attained. Something of the same fallacy underlies Mr. Price Williams's statement. He reckons that coal production will go on at an increasing rate everywhere, until it comes to a dead stop. If he really thinks this to be the correct way of looking at the matter, he must feel as one sitting in a railway train freighted with the most precious interests of the country, who knows that the engine is travelling onward with ever-increasing speed to a point where the rails cease and an impassable gulf must receive the whole. We do not accept this statement of the case, believing that the process of exhaustion will be gradual and in many respects imperceptible. There will be no catastrophe. The coal-fields of the country undoubtedly are being worked out one after another; and this process represents an exhaustion of capital that can never be replaced. Adjustments are constantly being made, however; and so it will be at the end, whenever this is to come. The train (to return to our illustration) will not plunge over a precipice with a full head of steam on; but, while still keeping the rails, it may gradually come to a standstill without shock to the passengers, who will thenceforward have to get out and walk, like their forefathers of the pre-Stephensonian age.

THE MANAGER OF THE COLCHESTER GAS-WORKS.—We learn that Mr. H. S. Pike, Secretary and Manager of the Elland Gas Company, has been appointed to the managership of the Colchester Gas-Works, in succession to Mr. Sidney E. Stevenson, who left England last Saturday for Canada, to enter upon his duties as Engineer of the Montreal Gas Company.

THE LONDON COUNTY COUNCIL AND THE GAS AND WATER UNDERTAKINGS.—The *agenda* paper for the meeting of the London County Council to-day contains the following motion in the name of Mr. James Beal:—"That it be referred to the Finance Committee to consider the steps to be taken, if they so advise, as to acquiring the undertakings now supplying London with water and gas—as to the former, whether new sources of supply should be reported on by the Engineers of the Council, and, if so, what time would be required for that purpose, having in view the report of several Royal Commissions; and as to the latter, the recommendations essential as to the competition of electric supply—such report to be presented not later than June next, in order to permit the requisite notices to be considered, prepared, and given in November for the ensuing session, and that the requisite powers may be obtained by any Bill promoted this session by the Council."

THE LONDON COAL AND WINE DUES.—Three notices of motion in regard to the London Coal and Wine Dues stand on the *agenda* paper for the meeting of the London County Council to-day. Mr. A. Hoare has given notice that he will ask for the appointment of a Committee to "consider" the dues, "with a view to the Council petitioning Parliament for their retention, modification, or expiry." Mr. C. Harrison has placed the following motion upon the paper:—"That the London County Council do forthwith give notice to the Metropolitan Board of Works of their intention to oppose the London Coal and Wine Duties Continuance Bill, stated in the report of the Metropolitan Board of Works of the 31st of December, 1888, as about to be introduced into Parliament by the City of London Corporation in conjunction with the Board of Works; and that copies of the resolution (if passed) be forwarded by the Chairman of the Council to all members of the House of Commons." As an amendment to this motion, Mr. Foster will move—"That a petition be presented to Parliament in favour of the renewal of the coal and wine dues, and that a Committee of the Council be appointed for the purpose of drawing up such petition, and of taking such other steps as they may deem desirable to secure the renewal of the said dues in relief of direct taxation." There will also come before the Council a letter from the Secretary to the London Chamber of Commerce, stating that the Chamber is opposed to the renewal of the coal and wine dues.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

In the early part of last week—but too late for the JOURNAL—we received a notification from Mr. William Longworth, the Honorary Secretary of The Gas Institute, to the effect that at a Council meeting held on the previous Saturday the revision of the rules of the Institute had been considered, and certain points in this regard agreed upon. It was also promised that full particulars of these recommendations would be communicated to members within a fortnight; and the notice concluded with an intimation to the effect that, in the estimation of the Council, "the prospects of the Institute are in every sense perfectly satisfactory." It is probable that if the framer of this latter sentence had known the character of the announcement that was meanwhile in preparation for publication in the JOURNAL, and had realized the significance of the declaration of one hundred and sixteen gentlemen that, in their opinion, the state of the Institute is anything but satisfactory, his cheerful optimism might have experienced a shock. Be this as it may, we recognize that it was high time for some statement of policy to be proffered by the Council. Through the courtesy of Mr. Longworth, we are to-day enabled to state further that the proposals of the Council are by this time issued, as we received on Saturday a copy of a circular bearing his signature, and evidently intended for instant distribution amongst the members. As it is marked "private," we are precluded from reproducing the statement without permission, which has not been accorded—in fact, since receiving it a telegram has come to hand requesting that strict privacy shall be maintained respecting it. The more one looks at the matter, and the longer one waits, the more one grows convinced that sufficiency only appertains to such a course as that which we have counselled all along, and which finds support again in Mr. Meiklejohn's letter published elsewhere. The hands of the Council of the Institute are tied; and their scope is too restricted even if they were free. There is so much to be done that it will be infinitely easier to make a fresh start, and utilize this opportunity for creating an organization that will be worth having. In this work, as we have already pointed out, all can join who desire the common good.

GAS AND WATER COMPANIES IN THE STOCK MARKET

(FOR STOCK AND SHARE LIST, see p. 448.)

BUSINESS on the Stock Exchange during the past week was below the average, and the markets for the most part ruled dull. This was more particularly the case after the settlement had been completed. Money has been in good demand, and the market is fairly firm, though it did not close at its best. While legitimate business has been restricted, the week has furnished a sensation in the feverish rush upon the Burmah Ruby Mines Company. The scene in St. Swithin's Lane might recall the days of Law and of the South Sea mania. We do not suppose that five per cent. of the struggling applicants knew or cared whether there was a ruby in all Burmah, so long as they could "stag" an allotment. Without croaking, we cannot help seeing in it one more among the disagreeable signs of the times. If history repeats itself, a financial catastrophe is preparing. Turning to our own Gas department, a very different state of things is presented. The extreme quietude of the market continues in a remarkable degree. It is more like vacation time, and there is very little to record. Even in the "big Company" there has been very little business; and Gaslight "A" has been extremely quiet. It has, however, been steady to a degree; transactions being marked almost without variation between 256 and 257. Even the secured issues have been neglected; a single mark in the 10 per cent. preferences being the sum total of the week. South Metropolitans, however, have been well up to mark, especially the larger issue "B." Commercials remain as they were the week before, quite stagnant. Among the Suburban and Provincial undertakings, British is the only one that has shown any vitality. The only variations in quotation (except those which are referable to *ex div.* adjustment) are to be found among the Foreign division—Buenos Ayres gaining ½, and Monte Video receding to a similar extent; but there has been hardly anything done in them. As a contrast to the universal quietude among the Gas Companies, the Water Companies have been more than usually active. Changes are but few, comprising a rise of 2½ in East London and 1 in Southwark and Vauxhall ordinary; but there is general business throughout the list. In connection with the rise in East London, it may be noted that if the Company declare a 7½ per cent. dividend they will be returning to the rate they used to divide two years ago and for some years previously.

The daily operations were: Monday was the busiest day in the week in Gas, though that is not saying much. Prices were steady all round, except that Metropolitan "B" was lowered 2. Water was brisk and firm—Southwark ordinary advancing 1. Tuesday's Gas transactions were mostly in South Metropolitans at middle prices. Water was rather quieter, and all quotations remained unchanged. The few transactions in Gas on Wednesday showed no feature except a fall of ½ in Monte Video. Water was active and strong, East London advancing 1. On Thursday no business whatever was done in Gas, except in South Metropolitan "B." In Water, only East London was dealt in, at an advance of 1½ more. On Friday, Gas continued very quiet; but Buenos Ayres improved ½. Water offered nothing to remark. On Saturday a

very moderate amount of business was marked in both Gas and Water; and all quotations closed without any further variation of note.

ELECTRIC LIGHTING MEMORANDA.

THE ELECTRIC LIGHTING SCHEME OF THE COMMISSIONERS OF SEWERS—MR. DENNY LANE UPON ELECTRIC LIGHTING—ELECTRIC LIGHTING CREATES A "TASTE" FOR MORE LIGHT—THE THOMSON-HOUSTON AND BRUSH SYSTEMS.

In another column will be found a report of the proceedings of the Commissioners of Sewers of the City of London with regard to the proposed electric lighting of the City streets. The matter has been for a long time under the consideration of the Streets Committee; and has been frequently mentioned in the JOURNAL. After much debate and many consultations with the City Engineer and Mr. W. H. Preece (without whom nobody seems able now-a-days to take a step in the direction of street lighting by electricity), the Committee agreed to recommend the course stated in their report, which is, briefly, the division of the City into three lighting districts, the successful contractors for which are also to have the monopoly of private lighting. All wires are to be placed underground, and when the profits of the undertakers exceed a 10 per cent. dividend the excess is to be equally divided between the shareholders and consumers. The present programme is a marked improvement upon the last scheme propounded by the Committee, which would have placed the City at the mercy of the Brush Company; but it is vitiated by the same fundamental error—the desire to avoid with respect to the City the provisions of the Electric Lighting Act. The Sewers Commissioners wish to be their own Board of Trade, so to speak; but the result is that the public are deprived of many of the safeguards of the Act. A very natural complaint was made of the communication of Mr. Preece's confidential report to the *City Press* before the majority of the Commission even knew of the existence of the document. Use was made of this communication to fervently plead for the adoption of the report, a cardinal point in which is the recommendation that the City lighting contracts should not be thrown open to public tender, but should be offered privately to the Brush Company, the Metropolitan Electric Supply, and the London Electric Supply Companies, who alone, in Mr. Preece's opinion, are in a position to serve the City satisfactorily. Seeing that the Brush Company have already given the City a taste of their quality, and that the others have not yet begun to do anything to justify the expectations aroused by their promises, it is difficult to understand the reason for Mr. Preece's advice. The Commissioners have adopted the proposition of their Committee; but there is a long way to be traversed yet before the electric light appears in the City streets.

At the recent general meeting of the Cork Gas Consumers' Company, Mr. Denny Lane gave the assembled shareholders an account of the present condition of electric lighting as it appears to him, after a study of the subject which has lately occupied a good deal of his attention. As in some other towns, a party in the Cork Corporation have a hankering after electric lighting, and Mr. Lane has been specially commissioned to investigate the subject for the guidance of his Directors and the satisfaction of the shareholders of the Gas Company. His statement was a summary of the recent doings of electric lighting companies at home and abroad; and it produced upon the meeting an impression, first, that electric lighting is not suitable for Cork, and, secondly, that even if adopted by a perverse and extravagant public authority, the Gas Company will not suffer any appreciable damage.

The peculiar ability, so conspicuous in electric lighting contractors, of inducing highway authorities to spend more money upon street lamps than was bargained for, is exemplified all over the world. We learn, for example, from an American source that the lighting of the city of Zanesville, Ohio, with gas in pre-electric times cost $5856. Then came the electricians, with their talk of 2000-candle power lamps, 70 of which were to supersede the 488 gas-lamps which had lit the city, fairly to the satisfaction of the taxpayers. The lighting by the new system was to cost $4900, thus showing a saving as compared with gas. The facts, however, do not bear out the promise. It takes 140 electric and 116 gas lamps to light the city, at a total cost of $11,424; and it is proposed to increase the charge to $16,111, or nearly three times as much as was formerly paid for gas—"and the people are clamouring for more light," says the report. This little bit of intelligence from far-off Ohio is decidedly interesting, as exemplifying the kinship of electricians in all lands. They certainly manage to make corporations spend more money for light than gas companies could hope to obtain; but there is the compensation that they create a craving for light which probably in most places brings more grist to the gas company's mill than to their own.

The Thomson-Houston system of electric lighting has not made so much headway in the United Kingdon as it has in the United States, where it is ranked among the most popular of the native systems. It is reported that at the beginning of the present year there were in America 435 Thomson-Houston arc lighting companies, supplying 52,000 lamps, and 175 incandescent lighting companies, with 11,275 lamps. The Company claim that last year they installed a greater number of local lighting undertakings than all the other American electric light companies combined. It is a remarkable thing that a system so fashionable across the Atlantic has not made corresponding headway on this side, more especially as the lamps really are as good as any in the market. We believe, however, that it is not the custom of the Thomson-Houston Company to claim an illuminating power of 2000 candles for their arc lamps, as the Brush Company do, in defiance of repeated exposures of the falsity of this pretence. It is not very creditable to the public, nor encouraging to electricians to pursue the way of truthfulness, when we see that a concern which bases its business upon an impudent imposition flourishes with us more than a less unscrupulous rival. It is, however, a question whether even the Brush Company are doing very much trade in arc lamps, which are distinctly retrograding in public favour in this country. It is worthy of mention that the attempts of electricians to produce a practicable arc lamp of small power, which would be a great lift for them, seem as far from attaining their object as when they were commenced.

GAS-TESTING AND STANDARDS OF LIGHT.

THE announcement made by Mr. George Livesey at the recent general meeting of the South Metropolitan Gas Company, to the effect that the Board of Trade have in contemplation a measure for improving the system of gas-testing as by law established, is calculated to arrest the attention of all who are interested in gas supply, not only in London but also in every part of the United Kingdom. It is uncertain, but may be presumed, that the Metropolitan Gas Companies will be the sole subjects of the photometrical reforms to be instituted by the Board of Trade; but experience shows that the methods of the Metropolitan Gas Referees are the pattern for photometrists in every part of the country. It may therefore be regarded as certain that the new practices to be suggested and perhaps legalized at the instigation of the Board of Trade, will have the most serious bearing upon gas photometry everywhere. It is believed that the reforms in question will be directed mainly to two points in photometry—namely, the standard of light, and the photometer itself. With regard to the latter, it is probable that an attempt will be made to reduce to something like order the prevailing confusion of photometer designs. The Board of Trade have followed the disputes between the Gas Examiners for the Metropolis and the Gas Companies, and desire to put an end to a state of things under which gas may be returned as below standard by one instrument and above it by another in the same house. The type of photometer is to be settled once and for all, so that the uncertainty proceeding from alleged incompatibilities between the Letheby, Evans, and other patterns of these instruments may be eliminated. It must not be overlooked that the photometer is essentially one of the simplest of philosophical instruments. Sir W. Thompson, making some photometrical observations recently by the aid of a white card, a lead pencil to cast a shadow, and a two-foot rule, deplored the superfluous complications that had been added to photometers by manufacturers of such apparatus. This is one way of looking at the matter; but it is not the only way. If we mention Sir W. Thomson's remark here, it is only to show that, having regard to the essence of photometry, the selection of a type of the instrument should be a simple matter. When we proceed to inquire the reasons for those instrumental additions so deplored by Sir W. Thomson, we find that they have been suggested out of regard for a great variety of minor, but still important considerations, which cannot be ignored by anyone who bears in mind the fact that the photometry of gas has a legal as well as scientific significance. We take it that even Sir W. Thomson, if police-court proceedings were a possible consequence of his observations, would prefer to base them upon some more permanent and verifiable apparatus than his favourite card and pencil. The truth of the matter is that the gas photometer is an instrument not to be judged upon one point alone. It is intended primarily for the measurement of the brilliancy of a light of a special character, which may be expected to vary in illuminating power from time to time, but within a very restricted range. The utmost precision is therefore required in all the appointments and fittings of the instrument, in order that its limited readings may not be affected by accidental or structural defects which might be less important if the range of observation were wider. The simpler the instrument the better, of course; and for this reason a gas photometer has been reduced by some authorities to a table carrying the two lights, the graduated bar, the screen, and the meter and clock. The drawbacks to this plan of reducing everything to its elements are that, in the first place, a darkened room must be devoted to the photometer only; and the work of the observer is carried on with less convenience than when he can stand outside his instrument. Hence the many varieties of box photometers have always been more popular than the apparently simple table instrument. The influence of air currents, questions of temperature, &c., have also to be considered. Indeed, so liable are the flames employed in gas photometry to external influences, that to preserve them in all circumstances in what should be their normal rectitude taxes the skill of the most experienced constructor. In undertaking to settle the type of instrument to be exclusively used, it will therefore be seen that the Board of Trade have chosen a task that is as delicate as, if sucessfully carried out, it will be beneficial to the gas industry.

With regard to the choice of a standard of light to supersede the universally discredited candle, it is almost certain that the Board of Trade will select pentane as the foundation of the new standard; but the form of the standard is not to be so readily anticipated. It may be well to recapitulate the steps that have been taken of late years to procure a settlement of the question of wherewithal the unsatisfactory candle can be replaced in the photometer. It is not necessary now to describe and discuss the various standards based upon molten platinum, the amyl-acetate

lamp, electrical incandescent lamps, and others, which for various reasons frequently stated may be regarded as having dropped out of the competition. The matter has formed the subject of inquiry by a Commission appointed by the Board of Trade, a Committee of the British Association for the Advancement of Science, a Research Committee of The Gas Institute, and by Mr. W. J. Dibdin, aided by a corps of experienced photometrists, for the Metropolitan Board of Works. The result of the reports of these investigators has been to narrow the choice of a standard for practical statutory gas-testing down to a flame produced by burning the vapour of pentane (a petroleum spirit) mixed with air, or to a portion of light of known brilliancy screened out from a coal-gas flame. There are several varieties of applications of both kinds of what may be distinguished as these standard *sources* of light. The pentane one-candle standard, as originally produced by Mr. Vernon Harcourt, one of the Metropolitan Gas Referees, consisted of a flame of a mixture of 25 per cent. of the vapour of the pentane, which evaporates freely at ordinary temperatures, with 75 per cent. of air contained in a small gasholder. The mixture was easily made by raising the holder (over water) to the height corresponding with the proportion of air required, and introducing the liquid pentane through a syphon or pipette. After standing for an hour or two, the pentane vapour would be diffused through the contents of the holder, and could be burnt as a jet exactly equal in illuminating power to a parliamentary standard candle. This is the Vernon Harcourt standard of light as it remains to this day, although various minor modifications have been introduced with the object of steadying the flame, &c. Next in order comes the Methven 2-candle standard, formed of a rectangular slot in a screen placed in front of a London Argand 16-candle gas-burner. It was soon ascertained that this standard is only constant in value for a limited range of the quality of the gas employed to produce it; and Mr. Methven accordingly improved it by previously carburretting the gas by passing it over a box containing pentane. This rendered the unit practically invariable. Both of these standards, it will be observed, are of small intensity—in this respect resembling the standard candle. The effect of this dimness of the standard light is the inequality in the normal positions of the standard and the gas-flame to be measured by it, with respect to the screen which is to receive equal illumination from them. In a 60-inch photometer, the standard would be 13½ inches from the screen on one side, while the 16-candle gas-flame would be 46½ inches distant on the other side. Every error of observation would be multiplied accordingly, and opacity of the air by reason of fog would operate to the disadvantage of the more distant light. It was with a view to remedying this drawback to a dim standard that the late Mr. Keates introduced his 16-candle sperm lamp standard, which failed to find favour, mainly because special care in trimming was needed to make it develop its normal power, and because of the disinclination of photometrists to adapt any standard involving a wick. Mr. W. Sugg then introduced his 10-candle standard, made of the same burner that is employod in the Illuminating Power Meter; the flame being reduced to a uniform height of 3 inches by a screen cutting off its top. The great convenience of this standard is unquestionable; all the readings from it on the photometer bar being decimal—thus 1·6 would be 16-candle gas, 2·0 would be 20-candle gas, and so on. It shares with the original Methven unit the feature of variability with varying qualities of gas; but unlike the Methven it possesses in the varying consumption required to maintain the flame at its normal height of 3 inches, an indication of the extent of its variability. Consequently by the employment of a correction table provided for the purpose, the standard is made reliable, becoming in this way "a varying standard whose variability is known," as it has been described by a good authority. Struck by its convenience, Mr. Dibdin has not only paid great attention to this standard in its original shape, but has also rendered it constant, and dispensed with the necessity for correction, by carburetting air for burning in it. This has been done in the simplest and easiest fashion, by interposing a box containing pentane between the air container and the burner; it being Mr. Dibdin's contention that air may be effectually pentanized in this way without going to the trouble of preparing a mixture in a gasholder as with Mr. Vernon Harcourt's method. Of course, if it be preferred, the 10-candle standard may be made equally well by the latter method. Lastly, the conveniences of a powerful photometrical standard and the desirability of establishing equality of the two sides of the photometrical scale, have instigated the production of a 16-candle standard made in the same way as the 10-candle standard, by screening off the top of an Argand flame supplied by pentane air gas, either according to the Vernon Harcourt method or by the Dibdin process of simple carburetting. It is also a subject of study at the present time whether the desired 16-candle standard cannot be made by simply carburetting common coal gas with pentane, just as Mr. Methven does for his improved unit. The advantages of using pentanized gas instead of pentane air gas are obvious. Pentane air gas is not so easily burnt as coal gas, and there is another question not yet settled, which is the degree of danger involved in the common use of pentane air gas in photometrical work. It is, we believe, unknown how much air is required to make an explosive mixture with pentane vapour. Mr. Vernon Harcourt's pentane mixture cannot be exploded; but the question of the precautions that will be required to prevent anything like the formation of an explosive mixture in the meter and pipes of a testing station in which pentane is constantly used, has never been authoritatively settled. A good deal of experiment with pentane and other standards has been going on at the new Woolwich testing station, where we understand that seven possible standards are in use besides the candle. These are: 1. The pentane single candle jet; 2. The Methven carburetted gas 2-candle unit; 3. The Sugg 10-candle standard with common gas, requiring correction by table; 4. The Sugg 10-candle standard burning carburetted air by Dibdin's method; 5. The Sugg 10-candle standard burning Harcourt's pentane air gas; 6. Sugg's 16-candle standard with pentane air gas; 7. Sugg's 16-candle standard burning Dibdin's carburetted air. A wealth of data respecting the comparative advantages of these standards must thus be in course of accumulation for the benefit of the promoters of the contemplated Bill. It should be stated that a great objection to the use of pentane gas—the trouble of preparing it of the right proportions—has been overcome by Mr. W. Sugg, who has perfected a simple and efficient arrangement for introducing a charge of the liquid under cover into the gasholder. It will probably be found necessary if pentane is used in the London gas-testing stations, to entrust the duty of preparing it to an officer of the Referees, who will make his rounds and keep the gasholders supplied independently of the gas examiners. The above we believe to be a complete statement of the present state of affairs in regard to gas-testing and standards of light in London.

DEATH OF MR. LEWIS THOMPSON.

We regret to have to record the death of Mr. Lewis Thompson—a gentleman who was personally known to many of our readers, and whose name is familiar to the present generation of gas engineers and managers in connection with his important investigations into the nature and properties of coal used for gas manufacturing purposes.

Mr. Lewis Thompson was the son of Mr. Thomas Thompson, of Byker, and was originally intended for the medical profession. With this view he entered upon a suitable course of study in Newcastle, and completed it in London. He was elected a member of the Royal College of Surgeons, but never practised, although for a time he was assistant to a distinguished Metropolitan surgeon. It is not necessary to refer here to the unfortunate domestic incident—an injudicious marriage—which eventually led him to abandon his profession and withdraw from the society of his friends, except as giving a reason for his subsequent proceedings, which led him to turn his talents to chemical investigations in connection with the production of coal gas. Mr. Thompson for a time held a subordinate position in a soap factory in Lambeth; but his ability forced itself upon the recognition of his employers, and he soon became their principal scientific adviser. From this time his reputation extended. He went to Paris with excellent recommendations to some of the most distinguished men of science in that city, and his intercourse with them continued through life.

Mr. Thompson's labours as a scientific investigator, however, will be best remembered—certainly by our readers—by his researches in connection with gas manufacture. The formation of the Great Central Gas Consumers' Company towards the close of the "forties" inaugurated the era of cheap gas supply in the Metropolis. The project, as is well known, excited considerable opposition; and among those who entered into the fray on behalf of the existing Companies was Mr. Thompson, who had established himself as a Consulting Chemist in Pancras Lane. This was shortly after the starting of the Journal. Mr. Thompson became a frequent contributor to its columns; and the volumes from 1850 to 1857 teem with articles from his pen. The second volume has for a frontispiece a plate of medallion portraits of the representative gas men of the day; and Mr. Thompson figures there in company with Clegg, Lowe, Malam, Kirkham, King, and Neilson. It is unnecessary to specify the various matters dealt with by this able and industrious writer; but conspicuous among them stand the important series of articles on "The Chemistry of Gas Lighting," which commenced in the number for Oct. 10, 1851, and were continued till the end of 1854. The tabulated results of Mr. Thompson's analyses of the different kinds of cannel and bituminous coal, which formed part of that work, although published thirty-five years ago, are acknowledged by Mr. T. Newbigging (who has reproduced them in his "Handbook") to constitute, with the exception of some tests made since then by Mr. James Paterson, F.G.S., of Warrington, "the most comprehensive and useful series of experiments that have appeared in this department of the science of gas lighting;" and he adds that "their general correctness and consequent value have frequently been proved." It is rather curious that, just towards the close of his life, Mr. Thompson's greatest work should be in process of utilization in our columns as the basis of a series of articles of a similar kind, but adapted to the requirements of the age, from the pen of a younger, but not less careful and painstaking worker. Apart, however, from his skill as a chemical investigator, Mr. Thompson was a keen controversialist; and in the fierce strife which prevailed in the days when he flourished, he wielded his pen with telling effect. As "The Man of Pancras Lane," he smote the then City Solicitor—Mr. Charles Pearson—hip and thigh; and he did his best to dispel what was then known as the "oil of vitriol bugbear."

Mr. Thompson's labours in connection with the gas industry were recognized in 1854 by the presentation to him of a testimonial, subscribed to by a large number of the most eminent gas engineers and managers of the time. This was the outcome of a meeting held early in that year under the presidency of Mr. George Lowe,

at which it was duly resolved that his "indefatigable and ingenious investigations into the nature and properties of coal, and the processes used in its distillation, and his disinterestedness in imparting information upon the true principles upon which the manufacture of gas should be conducted, entitle him to the esteem of his professional brethren." About £280 was subscribed; and the testimonial (which consisted of an exquisitely designed silver épergne, manufactured by Messrs. Garrard and Co., and bearing an inscription in the terms of the above resolution, was presented at a dinner given by the subscribers and other gentlemen professionally connected with gas manufacture, at the York Hotel, Blackfriars, on the evening of Nov. 1, 1854. From this date Mr. Thompson's contributions to our columns became less numerous; and they ceased altogether a few years later, when their author once more sought retirement. After a long interval, a communication from him on a subject with which he was specially qualified to deal—"The Production of Dye Stuffs and Colours from Naphthalene"—reached us, and was inserted in the JOURNAL for May 30, 1882. This was his last contribution of any importance.

We have said that Mr. Thompson "sought retirement." We might almost have said "seclusion." For some years before his death he resided in Newcastle, where, we believe, he held a small appointment in connection with a chemical works. But he was studiously careful to keep his abode a secret; and though he was a frequent contributor to scientific and other publications—the application of science to manufactures being his strong subject—and an occasional writer in the local press, he usually wrote under a *nom de plume*. Although he voluntarily severed his connection with the gas industry, he did not cease to take an interest in it, and to sympathize with those who were engaged in carrying on the great work in which at one time he took so conspicuous a part. This interest and sympathy he showed in a practical, yet unobtrusive manner; for we believe we are correct in saying that the £100 which figures in the accounts of the Benevolent Fund of The Gas Institute for the year 1882 as a "Gift from a Friend" was a donation by him.

The events which called forth Mr. Thompson's vigorous labours in connection with the gas industry are now matters of history. The man himself, in his chosen retirement, had been lost sight of by the comparatively few remaining gas engineers who knew him intimately in his prime; and he had scarcely been thought of except by those earnest students who profited by the results of his patient and valuable investigations. He was to all intents and purposes dead to the gas world long before the final separation came; and now that he has been laid to his rest, he can only be known by the works he has left behind him.

THE RELATION OF WATER SUPPLY AND DISEASE.

IN the JOURNAL for the 5th ult., we reviewed the successive Acts of Parliament by virtue of which the Thames Conservators became possessed of their present powers. Let it be granted, as a preliminary, that the Conservancy Board have exercised those powers as far as they would go, and to the best of their judgment. So much we are prepared to admit; but, nevertheless, it must be added that the Conservators, however good their intentions or zealous their action, have as yet failed to grapple fully with the great question of the pollution of the Thames. This failure is partly owing to a state of things to which the JOURNAL has repeatedly directed attention, in pursuance of the duty which it conceives is due to the Metropolitan public—a duty in the discharge of which we have received little or no support from our contemporaries. More than ten years ago, Mr. John Simon, in an official report of permanent value, pointed out that the question whether water can safely be drunk from rivers polluted by urban drainage is of more or less interest in every part of this over-populated country. Whatever facts can terminate this doubt bear upon every plan for the water supply of a population, and upon every scheme for the drainage of a town. Neither when Mr. Simon's report was perused nor even at the present moment can London, in this respect, be considered safe against the danger which the Thames Conservancy Acts were undoubtedly intended to remove. Lower than Teddington Lock, it is true, the river may not be used as a source of water supply. But above that point considerable and growing urban populations dwell beside the Thames or its tributaries; and hitherto the Legislature has not succeeded in providing against river pollution through the agency of the refuse which these communities drain into the stream. When Mr. Simon alluded to this condition of affairs, the mischief was, perhaps, not very extensive. The populations were scattered, and the drainage system incomplete; so that the admixture of contaminating matter with such a large volume of water was not conspicuously perilous. But even then it was foreseen by thoughtful men that the danger was one which must needs develop force with every year; and now we are face to face with vastly worse possibilities—indeed, probabilities—than those which seemed to be within measurable distance ten or fifteen years ago. It cannot be too often or too firmly insisted that the reform which was inaugurated by the Act of 1852, and afterwards supplemented by the various amending Acts referred to in our previous articles, remains imperfect and unfulfilled so long as these riverside populations exercise a right of discharging sewage into the drinking water of London.

No one disputes the sanitary advantage to be derived from a universal system of house-drainage—so that sewage may be rapidly discharged beyond an inhabited area; but the benefit thus gained is nullified if the removal of sewage is only attained at the imminent risk, if not the certainty, of poisoning the sources of water supply. In the one case we have, it may be, an unhealthy house; in the alternative we find a soil-fouled river. Instead of inhaling poison, we are compelled to drink it! The results of this choice of evils may not be immediately manifested. In regard to such matters, men are very much in the habit of living in a "fool's paradise;" but, given the fostering conditions, and the source of disease will supply the motive power which destroys its thousands ere the long-neglected remedy can be got into working order. History, which cannot yet be styled ancient, has again and again justified what we say. In connection with one of the cholera epidemics already referred to in this series of articles, Mr. Simon wrote: "Often, therefore, as town drainage extends, successive populations adown the stream get worse and worse water to drink; till the evil at length attains these large and dangerous dimensions which, *in respect of a single water supply*, it has been the object of this investigation to trace."

It is to be borne in mind that when the sewage of towns, or other polluting organic matter, is discharged into running water, though the suspended matters may be more or less perfectly removed by subsidence and filtration, the foul organisms in solution are still very persistent, no matter how great the length of the river may be, or how far the water-drinkers may live from its source. In his evidence given before one of the Royal Commissions to which reference has more than once been made, Professor Frankland declared that of all the processes which have been proposed for the purification of sewage, or of water polluted by excrementitious matter, there is not one sufficiently effective to warrant the use for domestic purposes of water which has been so contaminated. Rivers which have received sewage, even if that sewage has been purified before its discharge, must always be regarded sceptically as desirable sources—though it may be they are the only available sources—of potable water. The once-cherished theory of the self-purification of polluted rivers was almost finally exploded by the investigations made by the Rivers Pollution (1868) Commission. It was upon the ground-work of these investigations, both in regard to the Thames and several less important streams, that the Commissioners were driven to the conclusion that there is no river in the Kingdom long enough to effect the destruction of sewage by oxidation.

THE letters of allotment of the Boston United Gas Bonds were posted last Thursday.

MR. B. GREEN, the Engineer and Secretary of the Mitcham and Wimbledon Gas Company, has been elected a member of the Mitcham School Board.

MR. E. G. WRIGLEY has been returned, by a majority of 104, as a member of the Cheshire County Council, in opposition to Mr. Booth, the Conservative candidate.

AT a meeting of the General Purposes Committee of the Salford Town Council last Wednesday, a resolution was passed amending the powers granted to the Consultative Committee with reference to the civil action against Samuel Hunter, or any other action that might arise therefrom.

IN reference to the proposed electric lighting experiment in the City, our financial contemporary *Money* says: "It will be interesting to see what companies avail themselves of the opportunity to make proposals for lighting by electricity the City thoroughfares. One of the conditions provides that, if the profits arising from the contract exceed a cumulative dividend of 10 per cent. per annum on the capital invested, the excess is to be divided equally between the contractor and the consumer by the reduction of the charges. This remote contingency will surely not deter the electric light companies from making further experiments."

THE Winterthur Correspondent of *Industries*, writing on the 25th ult., said: "Although it is constantly said that the existing gas-works have in nowise suffered by the introduction of the electric light, yet the manufacturers of gas apparatus are complaining of scarcity of orders; there being hardly any new gas-works now erected in Switzerland. It is easily understood that the electric light would be preferred to gas in situations where water power is abundant; but the experience of the last year or two shows that the electric light is cheaper than gas light, even in cases where the power has to be obtained from steam-engines; and hence large manufacturers who have not already a gas supply prefer to put up an electric light installation instead of a local gas plant. It is remarkable that the incandescent gas light, although a year or two ago it appeared to give much promise, has never taken a firm hold in Switzerland."

THE market for regenerative gas-lamps of high power has received an addition in the shape of the Seegrün lamp, which was described in the JOURNAL for May 1 last year, and is now being supplied in various forms suitable for either domestic or street lighting. It is claimed for this appliance that the burner does not choke, and that there is an absolute consumption of impure gas with a minimum production of heat. Four sizes of the lamp are made; the lowest, with a consumption of 4 cubic feet of gas per hour, gives, it is stated, a light of 35 candles, or nearly 9 candles per foot. For the larger sizes, still better results are recorded; a lamp consuming 12 cubic feet of gas being credited with producing a light equal to 200 candles. For private lighting, the lamps are fitted to ornamental chandeliers, which serve to take off the heavy effect which the chimneys of all lamps of the regenerative type present, and which in some cases militates against their adoption. The Seegrün lamp claims certain advantages over its rivals; but these will have to bear the test of competition.

Notes.

MR. B. BAKER ON WIND PRESSURES AT THE FORTH BRIDGE.

In the course of some remarks following a paper on the Forth Bridge, recently read by Mr. B. Baker before the Society of Arts, the author described the manner in which the question of wind pressure had been studied in connection with this work. The first difficulty to be solved was the determination of the amount of surface to be regarded as exposed to the wind; because, although in a drawing the structure appears to have a plane surface, in reality it is a complicated network, comprising a great number of lattice-bars at different planes and angles, the exposed area of which might be anything. Mr. Baker began the investigation by having a metallic model of the bridge made exactly to scale, with every cross-piece and strut. This he hung at one end of a bar, at the other end being a flat plate, the area of which could be varied at pleasure. The bar was pivoted at the middle upon another bar; and then the whole thing was put into the water and towed after a boat. By slowly pulling the arrangement through the water, it was ascertained when the area of the flat plate exactly balanced that of the model of the bridge in its resistance to towing; and this was accordingly taken as the equivalent area of the model exposed to wind from one direction. From this datum the exposed area of the bridge itself was found. It proved to be about double the front surface as shown in an elevation. Having obtained this quantity, the Board of Trade required a wind pressure of 56 lbs. per square foot to be provided for. Anemometers at different heights of the structure do not show much variation beween the wind pressures at top and bottom. It is calculated that the wind pressure upon the bridge amounts to a lateral load two-and-a-half times as much as the heaviest traffic that can be brought upon the roadway.

SPIRAL-WELDED TUBES.

Mr. Bayles recently described to the members of the Franklin Institute the method of making spirally-welded steel tubes by machinery. He remarked that in iron and steel pipe making, it is desirable to use no more material than is needed to give the strength required; and that, as a rule, lap-welded tubes are enormously heavier than is warranted by the services to which they are put. This is because they cannot be made lighter. If the metal is heated in sheets to be afterwards drawn from the furnaces and welded upon a mandril, it is necessary that it should be of considerable substance in order to hold the heat. (Mr. Bayles evidently was in ignorance of the fact that straight lap-welded steel and iron tubes of the lightest metal are made by welding under a blow-pipe while upon the mandril in close proximity to the hammer.) Proceeding to describe the difference between spiral and straight lap-welding, Mr. Bayles stated that the weld in the latter case is a line of weakness, whereas in the former it is an additional source of strength. He claimed that the effect of internal pressure is to close a spiral seam, but to open a longitudinal one; remarking that he had seen a defective spirally-welded pipe leak under 20 lbs. pressure, become tight under 50 lbs., and remain tight up to 350 lbs. per square inch. This feature of spiral welding was explained and illustrated by rolling a strip of paper spirally into a tube and blowing into one end with the other end closed. The first effect of the internal pressure is to tighten the seams, so that the paper may be burst before the air will leak out between the edges of the parts in contact. The process of making spiral-welded tubes by machinery is simple and inexpensive. Steel of a suitable quality—*i.e.*, weldable, with a tensile strength of 65,000 lbs. and 50 per cent. reduction of area and 15 to 18 per cent. elongation—is rolled to the proper width, and as long as may be convenient. These strips are welded end to end in a machine; and are then wound upon large reels, whence they pass to the pipe machines. No mandril is used. The machine passes the strips at the desired angle through a cylindrical mould, after which the edges to be welded are formed by jaws and heated by two gas blowpipes before reaching the anvil, which is of considerable mass and extends the entire width of the skelp. The hammer is light, and usually strikes 350 blows per minute. The rate of production of the welded pipe averages 12 inches per minute, and the machines are so nearly automatic that very little skilled attention is required. It is remarked that the strength attainable by light pipe, when the material is disposed to the best advantage, is surprising. A 6-inch pipe made of No. 14 gauge iron of good average quality, showing under test 33,000 lbs. elastic limit and 50,000 lbs. ultimate strength, has a proof strength of 913 lbs. and an ultimate strength of 1383 lbs. per square inch of internal pressure. If made of good steel such a 6-inch pipe will carry 1106 lbs. internal pressure without deformation. The saving of weight in such tubes as compared with ordinary lap-welded tubes of equal strength is from two-thirds to three-fourths.

GREASE IN STEAM-BOILERS.

Mr. Thomas T. P. Bruce Warren has written to the *Chemical News* respecting the use of waste steam for heating boiler feed water. In some cases, he remarks, the exhaust steam from the cylinder is condensed, and flows back again into the boiler. If the cylinder is lubricated with a compound oil containing a saponifiable oil or fat, serious consequences are likely to result, owing to the pitting of the plates of the boiler. Mr. Warren states that a few years ago he had drawn from a boiler a sample of water which was said to contain grease. Both the water and the sediment in the boiler were, however, repeatedly tested for grease, with negative results; but eventually a white solid fat, consisting principally of stearic acid, was recovered from the scum of the boiler. As these earthy fats float on the top of the water, they stick to the boiler-plates, and, becoming decomposed, leave greasy spots. This grease prevents contact of the water with the iron, and consequently the metal is probably overheated in these places. At any rate, the plates quickly corrode in such places; but how far the action is chemical or mechanical, or a combination of the two, is not easily decided. It naturally follows from what has been said that petroleum or other non-saponifiable lubricator should be used for steam cylinders in any case when it is intended to return the condensed exhaust into the boiler. Mr. Warren records that he brought the subject of the corrosion of boiler-plates from this cause under the notice of the late Mr. T. W. Keates, Chemist to the Metropolitan Board of Works, who was of opinion that the action upon the iron was due to the sulphate of lime. If sulphate of lime is present in boiler scum, the corrosion is more easily explicable, as generation of sulphurous acid would not be improbable.

A PROPOSED FIRE-BRICK SYNDICATE.—It is proposed to form a syndicate in the fire-brick trade. Negotiations have been inaugurated amongst the makers in South Staffordshire, East Worcestershire, Leeds, and elsewhere, for buying up the works, and the declaration of a common price list. The required capital of the Syndicate is set down at £3,000,000; and Earl Dudley's name is mentioned as Chairman. If the project should be carried through, it will be a serious matter for all users of fire-clay, as it is proposed immediately to increase the price of bricks 5s. per 1000.

PRESENTATIONS TO MR. D. M'MINN AND MR. J. G. FRISKEN, OF FULHAM.—On Wednesday, the 13th ult., the officers and *employés* at the Fulham station of The Gaslight and Coke Company signalized the retirement of the above-named gentlemen—the former from the position of Station Clerk, and the latter from that of Assistant Station Clerk—by presenting them with testimonials in the shape of illuminated addresses and gold signet rings, in testimony of their esteem for them. Mr. D. M'Minn's elder son (Mr. F. A. M'Minn, the Company's Deputy Engineer-in-Chief) occupied the chair; and Dr. Daniell, the surgeon attached to the station, made the presentations. In doing so, he referred to the gratification which Mr. Daniel M'Minn must have felt, on his retirement, at seeing his two sons and a grandson occupying responsible positions in the largest and richest Gas Company in the world; and also to the interest which Mr. Frisken had taken in those who were engaged with him at Fulham. He expressed his own pleasure at making the acquaintance of both gentlemen, whom he wished, on behalf of the donors of the gifts, long enjoyment of their retirement. Mr. D. M'Minn, in responding, alluded to his 46 years' connection with the Company, and to the liberality shown towards him by the Directors on his leaving them. He likewise acknowledged with gratitude the faithful service rendered to him for 37 years by his assistant. Mr. Frisken having also returned thanks, the Chairman added a few remarks appreciative of the kind feeling which had been manifested to his father and Mr. Frisken by the officers and workmen, as exemplified in the testimonials just presented. He also thanked Dr. Daniell for his assistance and complimentary remarks. Mr. Tidey (the newly-appointed Station Clerk) proposed a vote of thanks to Mr. F. A. M'Minn for presiding; and this having been acknowledged, the proceedings closed. The addresses were in old oak and gold inlaid frames, with handsome oak easels, and were beautiful works of art.

THE LATE MR. S. P. LEATHER.—The remains of Mr. S. Petty Leather, Engineer and Manager of the Burnley Corporation Gas-Works, whose sudden death on the 20th ult. we announced last week, were interred at Marsden Chapel on the following Saturday. The funeral was attended by the men employed at the works and by various local officials. Mr. Leather, who was nearly 68 years of age, was a native of Sheffield, but was brought up at Beeston, near Leeds. On leaving school he was apprenticed with an engineering firm at Leeds, and was with Mr. J. F. Bateman when he directed the construction of the Manchester Water-Works at Woodhead. He afterwards became Water Manager at Stockport. After a short stay there he was called to Hyde to undertake a piece of engineering work in making sound a very faulty gas-tank. Mr. Leather successfully accomplished this, and remained in the town as Gas Manager. In 1863 he went to Burnley as Manager of the Corporation Gas-Works; and under his supervision they have become one of the most prosperous in the country. The consumption of gas for the past year was 296 million cubic feet, as compared with 49 millions in the first year of Mr. Leather's management—an increase of nearly 600 per cent. Mr. Leather leaves a widow and one son—Mr. John P. Leather, who has been for some time his assistant. At a recent meeting of the *employés* of the works, a resolution was passed tendering to Mrs. Leather and to Mr. J. P. Leather their deep sympathy in the loss they have sustained in the death of one who had at all times been a "kind, just, and generous master, and a friend to all his servants, from the highest to the lowest." A local paper says: "Unobtrusive as he was trustworthy and amiable, Mr. Leather has passed away as quietly as he lived, leaving behind him a most blameless record, and a memory that will long be held in affectionate regard not only by his official subordinates and superiors, but by every one who came into personal relationship with him in the busy round of his most industrious and useful life."

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

There was a fair gathering of the members of this Institution at the Nineteenth Annual Meeting, which was held last Saturday, at the Technical School, Princess Street, Manchester. The proceedings were strictly business like; and, with the exception of the delivery of the new President's Inaugural Address, the whole of the time devoted to the meeting was occupied in the election of officers and similar routine work. Mr. T. Duxbury, of Darwen, the President for the past year, occupied the chair at the opening of the meeting. The following report of the Committee was first read by the Honorary Secretary (Mr. Harrison Veevers, of Dukinfield), and adopted after a brief discussion:—

The Committee have pleasure in reporting the continued activity and success of the Institution. The attendance of the members at the quarterly meetings has been satisfactory.

The number of members has increased by three; making a total of 93. The Committee regret the loss of one member by death—Mr. Leather, of Burnley, who, although he took no active part in the affairs of the Institution, was a warm supporter of it.

During the year valuable papers have been read at the meetings of the members, one of which, on gasholder construction, has excited the attention of the gas engineering profession throughout the world. This paper, by Mr. T. Newbigging, on "Gasholders without Upper Guide-Framing," was read at the meeting, on the 25th of August, at Doncaster, and was exemplified by models; the discussion on the 1st of December, at the meeting in Manchester, was assisted by Mr. W. Gadd, C.E., who exhibited other models.

The subject of the rivalry of gas and other illuminants, which was first introduced to the consideration of the profession by this Institution, was this year continued by a contribution from Mr. Dalgliesh, and by statistics and advice in the excellent Inaugural Address of the President at the annual meeting on the 3rd of March last. The discussion of the paper by Mr. Dalgliesh was taken on the 1st of December.

A paper by Mr. T. Newbigging on "The Presence of Water or Moisture in Coal, and its Effects"—a subject not previously discussed—was also read at this meeting; but, owing to the pressure of business, the discussion on it was adjourned.

On the 19th of May the members met at Northwich, and inspected the Anderton hydraulic lift, and a salt mine; and on the 25th of August held a meeting at the Doncaster Town Hall—the Mayor having kindly given the use of the Council Chamber.

The members will thus see that the Institution retains its vitality and its ability to promote the interests of the profession by presentation of papers on novel and interesting subjects.

The members have been furnished with copies of the balance-sheet. It will appear that the finances are not in so flourishing a condition as a year ago; but a brief explanation will set the matter right. Last year there were no arrears at the end of the year; and a sum of £5 15s. 6d. was received in advance, and this was taken to the credit of last year. Now there are arrears amounting to £14 14s.; and the Committee would impress on the members the desirability of the subscriptions being paid promptly, so as to relieve the honorary officials in their duties.

At the meeting in December, Mr. T. Banbury Ball, of Rochdale, was unanimously elected President of the Institution for the year 1889-90. The retiring members of the Committee this year are Mr. Miles and Mr. Chester.

THOS. DUXBURY, President.
HARRISON VEEVERS, Hon. Sec.

On the motion of Mr. D. Clarke, of Ashton-under-Lyne, seconded by Mr. I. Carr, of Widnes, Mr. W. W. Hutchinson, of Barnsley, was elected Senior Vice-President; and on the proposition of Mr. T. B. Ball, of Rochdale, seconded by Mr. W. Woodward, of Bury, Mr. T. O. Paterson, Assoc. M. Inst. C.E., of Birkenhead, was appointed the Junior Vice-President. Mr. T. Newbigging, of Manchester, was re-elected Treasurer, on the motion of Mr. J. Dalgliesh, of Glossop, seconded by Mr. W. W. Hutchinson. The next business was the appointment of Secretary. Mr. Veevers proposed that Mr. S. S. Mellor, of Northwich, should be elected to this post; and the motion, having been seconded by Mr. W. W. Hutchinson, was carried. The election of two members of the Committee gave rise to a somewhat unpleasant discussion; the result being that Mr. J. Timmins, of Wigan, and Mr. W. Woodward, of Bury, were appointed to the vacant positions. Mr. W. Smith, of Hyde, and Mr. J. Mackenzie, of Wilmslow, were re-elected Auditors. Mr. Duxbury then vacated the chair; and his place was taken by Mr. T. Banbury Ball, of Rochdale, the President-Elect. As is customary, thanks were awarded to Mr. Duxbury for the manner in which he had discharged the duties of the chair during the past year; and the new President then read his Inaugural Address, which is given below. Other votes of thanks closed the proceedings. The members and a few friends afterwards had tea together at the Crown Hotel.

INAUGURAL ADDRESS.

Gentlemen,—Inexorable custom has laid down a rule that, in assuming the position to which, by your courtesy and kindness, I have now been promoted, the occupant should deliver what is termed an "Inaugural Address," which, being interpreted, means that you must listen for an indefinite time to statements or theories from which you may entirely dissent, but which you are, by the same inexorable custom, expected to receive as if you unreservedly accepted both the one and the other. I confess I have sometimes felt considerable sympathy with the advice which a well-known American writer makes one of his characters suggest to the Secretary to the Treasury—viz., that he should enliven his official report with a little humour, and that possibly a few conundrums introduced therein might lead to their being more widely read and better appreciated. But I am afraid that, in addresses of a technical character such as you expect from me to-day, public opinion has scarcely reached such a point of toleration, and might suggest that we have problems enough confronting us in connection with our business without concerning ourselves with others entirely outside it. I must ask your indulgence therefore if, for a short time, I occupy your attention with matters that you are all familiar with.

An attentive perusal of the addresses which have been delivered from time to time before this and kindred institutions, and of the papers on various subjects which have been laid before them, convinces me of the value of these associations to us all, and shows the variety of subjects which demand and receive our attentive consideration. If I do not confine myself to any particular subject, but review briefly the present position and future prospects of our industry, it is not because there are no difficulties unsurmounted, and no problems left unsolved in connection with gas manufacture and distribution, but rather that these can be more conveniently dealt with in a form which admits of their free discussion and examination.

In speaking of the present position of the gas industry, it is not my intention to trouble you with statistics as to its magnitude, and the responsibilities resting on the shoulders—or rather, let me say, on the hearts and minds—of those who control it; but rather to consider the position which gas holds to-day, in regard to competitors, as contrasted with that of past years. No one will dispute the fact that gas still occupies by far the foremost place among artificial illuminants—indeed, until quite recently, competition was a word almost unknown in our vocabulary; but we must, I think, frankly admit that in future we shall probably learn more of its meaning in relation to our own particular production.

Electricity was long considered entirely out of the race; and so long as the energies of electricians were principally confined to floating bubble companies and fleecing the public, this was doubtless true. But since their energies have been turned into more honourable, if less lucrative channels, and devoted to the improvement of the apparatus necessary for the economical production of electrical energy, more substantial advance has undoubtedly been made. The Governor of The Gaslight and Coke Company, in his address to the shareholders at the last half-yearly meeting, dealt with this subject at some length; and, to prove that electric lighting was without any but a beneficial effect upon the business of the Company, compared their revenue from the Bond Street district (in which there is more electric lighting than in any other), and showed that in 1888 the revenue from a given area was £7836, as against £7527 in 1885. But the question might well be asked, "How would these two periods have compared, supposing electricity had not been adopted within this area?" The JOURNAL OF GAS LIGHTING also, in speaking of the accounts of this Company for the past half year, says: "The public have been taught once more that the cost of gas is diminished whenever this is rendered possible by the course of trade; and investors can judge for themselves, from the same evidence, how little the business of gas supply is affected by all the loudly-heralded progress of electric lighting. There is probably more electric lighting scattered throughout the district of The Gaslight and Coke Company than anywhere else in England. All the principal theatres, railway stations, public halls, commercial establishments, and palatial town residences, in which the electric light is most favoured, and where its cost is least objected to, lie in the area served by this particular Gas Company; and what harm has it done them?" Surely this much harm at any rate has accrued—that every 1000 feet of gas displaced in any of the establishments enumerated means 1s. lost to the pockets of the shareholders. It may be said that electric lighting has nearly disappeared from the streets, and that even the latest installations have been conspicuous failures in this department. But, on the other hand, this is not the class of custom which we have been wont to regard as the most profitable; and we might have looked upon success in this direction with some equanimity, so long as the disparity in price remains as it is. When, however, it comes to taking the place of gas in large industrial concerns, where economy is of prime importance in all matters of expenditure, and which we have hitherto regarded as a field exclusively our own—and such instances are not uncommon in this district—I think we are bound to admit that we have here a competition worthy of attention,

Again, we have the competition of cheap mineral oils, which some are disposed to regard as more formidable than electricity, though I confess I am not of the number; and we have had many suggestions made to us of late how best to secure this class of customers for gas. On this subject I should just like to say a few words, as I stated some time ago that, after all the exertions to this class of custom, it might be found that it was unremunerative. I look upon it in this way: We necessarily incur a certain expenditure every year for inspection of meters, collection of accounts, book-keeping, bad debts, disconnecting meters, and so on. In my own case, this amounts to about £1500 per annum. We have rather a large number of accounts—say, in round numbers, 20,000. This is equal to 1s. 6d. per customer. Now, 7500 of these customers burn 22½ millions, or an average of 3000 cubic feet per customer. The cost of the foregoing items, therefore, in each of these cases amounts to 6d. per 1000 cubic feet. If I treat the leakage account in the same way (as, in my opinion, is perfectly legitimate), we shall add still more to the cost. So long, however, as the price of gas is maintained at a figure which allows a margin of profit in excess of 6d. per 1000 feet, these consumers are sources of profit; but when gas is sold at or near cost price, this is no longer

the case—they then entail a tax upon the better customers. To keep up the price of gas in order to subsidize the rates is, unfortunately, not a rarity; but on what ground it can be justified I have hitherto failed to understand. I have heard the argument used oftentimes, that the ratepayer, as such, is entitled to some return for the risk he runs. But what about those ratepayers, dead and gone, who, having run no risk, and found no money, have nevertheless pocketed, in the shape of profits, as much as the gas-works cost in some instance? That the tenementary occupier pays rates in this way which would otherwise fall upon the owner of the property, is hardly more sound; for it involves a payment of rates in cases where the property is supposed to be let free from rates. It may be, and often is, urged that it is impossible to alter the incidence of taxation, which has been established for years, without hardship, and possibly injustice, to some portion of the community; but this might just as well be urged in defence of every abuse which has flourished and gained strength from toleration, and takes no account of the injustice which has been done to those who in the past have paid more than they ought legitimately to have done.

That local authorities at any rate should not make large profits out of the supply of gas, to be afterwards devoted to other purposes, seems to be the present opinion of the Legislature. Take, for example, the case of the Oldham Corporation in 1886, in which it was laid down by a Select Committee that they should be confined to 6 per cent. profit on the capital employed, and that interest and sinking-fund charges must be met out of this; in addition to which the power of charging a higher price for gas to the extra-municipal area was taken away. I only refer to these matters, however, as amongst the influences which serve to prevent the more rapid advance of gas lighting.

There is yet another aspirant for custom to which I may refer, though it is of quite recent introduction so far as this country is concerned, and is chiefly applicable to industrial purposes. I mean the water gas introduced by Mr. Samson Fox, of the Leeds Forge Company. It would be most unfortunate if any such poisonous compound was ever introduced for domestic purposes; and it is scarcely probable that it will find favour for other than industrial uses, even while carburetting oils are as cheap as they are to-day, and without carburetting the use of magnesium combs is a sufficient deterrent to its general adoption.

I am referring to these various aspirants for public favour (and there are others to which it is not necessary to call special attention), not because I think they seriously threaten our position at present, but for the purpose of pointing the lesson which they seem to me to convey. We have been for so long practically without competitors, that I am afraid we have come to regard our wares as absolutely indispensable, and have acquired a sort of "take it or leave it" habit, which is, to say the least, scarcely conducive to the extension of business. This would be a fatal error if continued. Signs are not wanting, however, to show that the old order of things is giving way before a new and better one, whereby our customers are able to make the best use of what we supply them with, free from many vexatious little restrictions to which in years gone by they were often subject. We hear much talk now-a-days of technical education, and something has been done to educate the gas consumer in the many and varied uses to which coal gas is applicable; but these efforts have been by no means systematic—and why? Partly from lack of opportunity, and partly from an inherited dislike to pushing business in this way. The average gas manager has already occupation enough, if he pays due attention to his work, to employ all his time and energy. Who, then, is to undertake this business of enlightening the customer as to the best means of utilizing what you sell him? It should not be difficult to find persons capable of undertaking this duty under the instructions of the gas manager—persons who have some knowledge of gas-fittings, and are competent to advise as to their fitness for particular uses, who could also take charge of the gas-stoves let on hire, and give useful hints as to their successful employment; taking care that no effort was spared to make everybody familiar with all the uses to which gas may be applied. There are people who would doubtless resent any attempt to teach them what they think they are perfectly conversant with already; but these may be left to their own devices, and their failure will not be through any fault of ours. What I have suggested would, of course, involve some expense, and might possibly return no immediate interest on the outlay; but I am convinced it would be money well spent, and would result in considerable benefit eventually. The difficulty is to convince those who have the final decision in such matters.

No one would wish to disparage the achievements of those who, under many adverse circumstances, laid the foundations of our flourishing industry; but we should be blind to every indication of the times if we did not recognize the changed conditions under which business of every kind is carried on—our own, as well as others; and, utilizing to the utmost the advantages which possession affords, let us take care that our production is not overlooked for lack of advertising, nor discarded because our customers do not know how to use it. I have said that the average gas manager has already plenty to do without occupying himself with trivial duties which a subordinate of moderate capacity might well undertake. But there are numerous instances in which every detail of manufacture and distribution, and every trivial matter of routine, falls on the manager alone; thereby preventing him from making himself familiar with what is going on around him, and depriving him of opportunities of usefulness. In such cases I think some assistance in the direction I have pointed out would be a judicious investment.

A conscientious discharge of one's duty necessitates close application to work. It does not, however, follow that the man who spends the most time on his own works makes the best gas manager; for without a knowledge of what others are doing, and without seeing their failures as well as their successes, progress at home is well-nigh impossible. With every disposition to afford information, and gladly recognizing this disposition in others, one cannot but feel that the most useful information is sometimes incapable of being conveyed in tabulated form, or as question and answer. I would plead, therefore, for such assistance in routine work as would render the acquisition of this practical knowledge easier, and at the same time make the members of our profession better known to each other, and consequently more ready to impart it. It is not suggested that a man should be constantly from home under the pretence of seeking information of which he ought to be in possession; but that he should have such facilities as would enable him to make himself most useful to his employers, and to advance himself in the knowledge of his profession.

It is gratifying to notice a general tendency to reduction in the price of gas; and we may, I think, legitimately take credit for bringing about so desirable a result. Possibly, many people would be disposed to attribute this result to cheap fuel. A very superficial examination of the question would, however, soon convince any unprejudiced inquirer that this was only one factor in the calculation, and not the most important one even then. If we go back some 20 years (no great length of time in the history of a great industry), we shall find that the consumption of cannel by the Metropolitan Gas Companies was almost four times as much as it is to-day, although the quantity of gas sold was less than 10,000 millions; whereas in 1887 it was nearly 24,000 millions. In the former period, the gas sold amounted to 8438 cubic feet per ton; the quality being 14 candles. In the latter period it was 9639 cubic feet, of 16-candle power. In 1869, a leakage of 15½ per cent. in The Gaslight and Coke Company's district was said to bear favourable comparison with any other undertaking in the Metropolis; and the dividend of this Company was at the rate of 4¼ per cent. per annum. The leakage is now brought down to about 5 per cent., and the dividend brought up to about 13 per cent., although the price of Newcastle coal did not differ materially from its present value during the period I have mentioned. Clearly, then, cheap fuel cannot be credited with this improvement. Other examples of similar progress abound; and I mention this one simply as a typical instance, because continuous records are easily accessible in substantially the same shape—it being just 20 years since the present form of accounts was issued by the Official Auditor.

The prices of most commodities in recent years have been such as to enable us to carry out extensions and erect new plant on a most economical scale; entailing thereby a decrease in the charge both for interest and maintenance. There has also been noticeable a general tendency in the direction of economy in nearly all structural work, which is also having its effect. The introduction of stoking machinery—though necessarily a gradual process, and not available for gas-works of all sizes—is also effecting economy wherever introduced; and its improvement and simplification still occupy the attention of thoughtful minds. One step in advance has been the adoption of rope-driving from stationary engines, as applied at the Blackburn Gas-Works. Attempts have also been made to apply a system of automatic charging by means of pistons attached to the retort mouthpieces; but at present I am unable to give you any particulars as to its working. It shows, however, that we shall not lack assistance in our endeavours to secure the best appliances.

The application of gaseous firing has also resulted in some economy in the cost of gas manufacture, and continues to find increasing favour. It is sometimes urged as a reproach against us that we are an exceedingly conservative body—not in a political sense, but as sticking to traditional usage; and that it is difficult to induce us to adopt a new idea. I fancy if we were disposed to adopt every novelty submitted to us simply because it was a novelty, and without any endeavour to assure ourselves that we were adopting something better than we were discarding, there would soon be a peremptory stop to such rashness; and the difficulty of getting new apparatus introduced would become greater, because of the number of failures which would inevitably ensue. We have in all cases a complicated and expensive plant already provided; and it is our duty to make the best possible use of it—adapting it to altered conditions as time and opportunity serve, and as we are enabled to assure ourselves of the probabilities of success of the apparatus we are introducing. It is now generally acknowledged that regenerator furnaces, as first submitted to our notice, were needlessly complicated and expensive; and we are gradually adapting them to the varied conditions of different localities, instead of trying to adapt the localities to them.

We have not yet attained the Elysium of purification in closed vessels; but the attempt to secure this by the means now in course of trial at Belfast will be watched with great interest, and with every desire for its success. I learn with pleasure that some measure of success has already been achieved—2½ million cubic feet of gas per day having been passed through the apparatus; but, as steam-jet exhausters are in use on the works, the quantity of ammonia in circulation increases slowly, and is not yet sufficient to purify the gas entirely. However, six-sevenths of the acid impurities are removed; and as soon as the quantity of ammonia

increases, complete success is confidently anticipated. I should add that, at the time of writing, the plant had only been in use some three weeks. In introducing new processes, there are always unlooked-for delays and difficulties, which are not appreciated by on-lookers. Apart from this process, however, the increased knowledge of the chemistry of purification now possessed enables the sulphur question to be dealt with more easily; and at less expense than used to be the case.

New processes of gas manufacture, and new apparatus applicable both to manufacturing and distributing plant, are being constantly brought to our notice—some of them so palpably impracticable as not to be worth more than passing notice; others claiming our careful consideration and practical testing. Amongst the new processes may be mentioned the one which Mr. I. Carr, of Widnes, has been trying, and from which he appears to have obtained some remarkable results—results which are not easily understood when the attempts hitherto made in this direction are borne in mind. But they have sufficiently convinced Mr. Carr to induce him to extend the use of the process; and we may possibly hear something from him on the subject on a future occasion, so I will content myself with this brief reference to it.

Improvements will, of course, continue to be introduced from time to time; but it is not to be expected that their influence in the future will be as great, at all events in a monetary sense, as it has been in the past. Every reduction in the price of gas reduces the margin on which we have to work, and renders further reduction more difficult of accomplishment, but at the same time puts a greater distance between us and our competitors, and renders our position more secure. So far as one can see at present, it will be by close attention to every detail, and by watching those "next-to-nothings," which, in the aggregate, make up the tangible something, that we shall be enabled hereafter to make further concessions in price.

The treatment of what are usually termed "residual products" does not commend itself to some engineers as appertaining to the business of a gas company or corporation. The great fall in the value of ammonical liquor has, however, forced the matter on the attention of many managers; and its treatment is gradually being taken up, and will eventually be very general at gas-works. This will be facilitated by the improvements which have been effected in the plant used for the purpose, and the reduction in its cost. These have been brought about in their turn by the increasing demand for this description of apparatus; and there are at least half-a-dozen manufacturers of sulphate plants from which to make a selection. In this regard, mention may also be made of the Claus sulphur-recovery process, which has been adopted in several gas-works as well as sulphate-works, where continuous processes are used, and forms an essential feature in Mr. Chance's patent for the recovery of sulphur from alkali waste. Speaking from a personal knowledge of the process, I consider it an excellent adjunct to a continuous sulphate plant, and one calculated to minimize any risk of nuisance or inconvenience.

Tar distillation is undertaken by very few gas companies or corporations; and there are certainly objections to its adoption which do not apply to the manufacture of sulphate of ammonia. In the first place, it requires skilled technical supervision, and is attended with a certain amount of risk, though not so much as some people imagine. The item of carriage, too, is not of so much consequence as in the case of sulphate; inasmuch as there is nearly a ton of products to dispose of from every ton of tar distilled, whereas there is only a ton of sulphate from 10 or 12 tons of liquor. I am disposed to think, however, that tar distillation will eventually be undertaken by the larger towns owning gas-works; and whatever can be done to assist in producing gas at the lowest possible price, seems to me to come legitimately within the sphere of our operations, even though involving additional responsibilities.

The erection of coal-carbonizing works which the era of inflated prices for residual products brought about, may be said to have ceased when the collapse in prices set in; but those now working are reported to be making a profit, though apparently not such as to encourage further ventures in this direction. They tend, however, to keep the values of tar products lower than they otherwise might be; and the yield of ammonia from the Scotch shale-oil works performs a like office for sulphate of ammonia.

Technical education has not been without its effect upon the gas manager of to-day, and will doubtless exercise a more potent influence in the future—multiplying his opportunities of usefulness as his knowledge, practical and theoretical, of the materials with which he has to deal increases; and it is to be hoped that it will also afford him still further assistance by raising the standard of efficiency of all his subordinates, and thereby contribute to the lasting success of our industry. There are, however, qualities requisite which no amount of technical education can supply. Tact, sympathy, firmness, and decision, when occasion requires, are essential in dealing with workmen and the public generally. These are not inherent in all men; but they are virtues which may, and should be cultivated, for their value to persons holding public appointments is incalculable.

When it is borne in mind that nearly 80 per cent. of the gas companies, and upwards of 70 per cent. of the corporations owning gas-works make less than 100 million cubic feet each per annum, it is obvious that there is not sufficient scope in any one of these cases for costly technical supervision, and that the manager will be required to discharge a great many duties which in the larger undertakings can be deputed to subordinates; and it is a matter for congratulation that these multifarious duties are so well performed, and that the undertakings are so uniformly successful. The future will afford increased facilities for acquiring knowledge of all kinds; and a knowledge of chemistry will assuredly not be the least useful, for it is certain to play a prominent part in the development of gas manufacture. But the engineering branch of the profession must always hold the more prominent position, and afford equal, if not greater scope for the inventive faculties. Both will be indispensable qualifications of the gas engineer of the future.

The trade of the country generally appears to be entering upon an era of prosperity, which we all hope may be a long one; for we naturally expect our own industry will receive an ample share of this success. If, however, gas consumption develops, so also will the competition to which I have referred; and while entertaining no doubt whatever as to our ability to hold our own against all comers, I think it mistaken policy to under-estimate the strength of an opponent—better, even, to over-estimate it, if it induces us to put forth greater efforts than we otherwise would do, and thus add greater security to our position.

There are other matters, no doubt, to which some may think I ought to have referred; but I have been anxious to avoid subjects which are, after all, not of primary importance, and on which the difference of opinion—now acute—may become considerably modified. Moreover, I am afraid I have detained you at great length on subjects which may have but little interest for you. It is not an easy matter to determine on what topics to address you; and for your courteous attention to the remarks I have submitted, as well as for the honour you have done me in selecting me as your President, I return you my grateful thanks. It will be my endeavour so to discharge the duties of the office that the interest of the Institution may not suffer in my hands, and that, when the time comes for me to make way for my successor, your good opinion of me may be unimpaired, and the prosperity of the Institution undiminished.

ON THE CONSTRUCTION OF GASHOLDER TANKS.

By Charles Hunt, M. Inst. C.E., of Birmingham.

[A Paper read before the Association of Birmingham Students of the Institution of Civil Engineers, Wednesday, Feb. 20, 1889.]

(*Continued from p.* 388.)

Wrought-iron annular or part annular tanks have occasionally been employed in situations where either the excavation proves unsuitable for building, or materials and skilled labour are not readily available, as in some places abroad, or the excavation cannot be economically proceeded with to the full depth. As will be seen from the diagram fig. 2, this kind of tank consists of an annular water space or trough resting on a suitable foundation, the centre of the tank being left unexcavated, and made water-tight by a covering of clay puddle or by other approved means.*

Returning now to the consideration of excavated tanks, constructed of brick or other similar material, it may be observed that these are divided into two principal classes—viz., one in which the tank is made impervious to water by a continuous envelope or basin of clay puddle, and the other in which the same object is secured by an interior coating of cement rendering. In the first of these, the water passes through the more or less porous wall of the tank, and its pressure is consequently exerted directly against the puddle and earth backing; while in the other, the impervious coating of cement causes the wall itself to be opposed to the full bursting pressure of the water. In the one case, therefore, the utility of the structure depends entirely upon the stability of the earth backing—the wall being little more than a casing to keep the tank in shape; whereas with a rendered tank, while dependence upon the earth backing is equally absolute, and its solidity a matter of even greater moment, this only arises from the fact that, as a rule, it could not answer, from an economical point of view, to construct the wall of sufficient strength to make it wholly independent of assistance from the backing. To do so would be to throw away one of the great advantages of excavating. There is, moreover, an essential difference in the effect upon the two kinds of tanks of a partial failure of the backing, and one which it is highly important to bear well in mind. While the wall of a rendered tank would almost certainly be ruptured (its tensile strength not being sufficient to resist the bursting pressure of the water), a puddled tank may be expected to remain water-tight, because the plastic clay would yield to a considerable extent, without actually breaking off, and the wall itself would remain firm. Consequently, the nature of the material which is to form the backing ought to be, to some extent, a determining factor in the choice of the method by which the tank is to be made water-tight; although probably in most cases the governing one would be that of comparative cost. If clay be met with in the excavation, or can be procured in the more immediate vicinity of the work, it will in all likelihood prove the cheapest; but where it has to be transported from a considerable distance, the comparison will be in favour of cement rendering, the cost of which cannot vary greatly throughout the country.

The same consideration of cost should determine the choice of materials to be employed in the construction of a tank. Until within a comparatively recent period, bricks and stone were exclusively used; but concrete (which, like Portland cement itself, is of modern introduction) is now very largely employed.

* This was taken from the illustration appearing in the Journal, Vol. XXVI., p. 686, and in "King's Treatise on Coal Gas," Vol. II., p. 108.

Each of these materials is suitable with clay puddle or cement rendering; and our selection should depend upon local circumstances. In some districts—our own, for example—excellent bricks are to be had at a very moderate cost; while, on the other hand, good material for concrete is comparatively scarce. Again, in other districts, bricks are dear, and often of very inferior quality; but excellent gravel, suitable for concrete, is to be had in abundance, frequently from the excavation itself. In all gas-works there are furnace clinkers and fire-brick *débris* almost constantly available. These make very good concrete, and are generally used for this purpose, so far as they go. The usual mixture for concrete is one part of Portland cement to six or seven parts of gravel or ballast, which must be free from clay, having a proportion of broken fire-bricks and clinkers, together with a small quantity of clean sharp sand.

In deciding upon the thickness of the wall, the fact has to be taken into account that, although during construction, and until the tank is filled with water, the wall has to perform the function of a retaining wall, by sustaining the whole weight of the earth behind it, yet the rule for determining the thickness of a retaining wall cannot apply, because of its curvature. This affords an immense advantage in point of strength, although to what extent precisely cannot be readily calculated. All experience, however—and experience in these matters usually precedes theory—proves that, with a reliable foundation and a tolerably wide base, the wall need not be of much greater thickness than will ensure its keeping in shape until properly and firmly set, bearing in mind the great pressure it may have to sustain while yet "green." As an additional precaution, it is not an uncommon practice, where bricks and lime mortar are the materials employed, to interpose courses set all round in Portland cement, at intervals of a few feet in the height. Some engineers, in fact, go so far as to rely wholly upon Portland cement, because it sets much more quickly than lime, besides possessing much greater tenacity. This, however, is less admissible for a puddled than for a rendered tank, because, being less porous than lime, its use exposes the wall in a greater degree to the bursting pressure of the water. In a general way, the thickness of tank walls at the bottom may be stated as varying from say 18 inches to about 6 feet, according to depth and diameter; this being reduced by set-offs to one-half, or less, at the top.

The diameter of the tank and the thickness of the wall necessarily determine the area of excavation. In days gone by it was the practice not only to clear out the actual site of the tank, but also to work down the soil outside, all round, to its natural angle of repose; filling up against the wall as the work proceeded. This method is even now occasionally resorted to, but, as a rule, is not admissible for tanks of what have for a long time been regarded as only moderate dimensions; the method generally followed being to form a circular trench of the full width required at the bottom, allowing for the footings of the wall and also for the puddle to be used. In setting out this trench, sufficient space must be left for timbering—each frame of timber occupying 8 or 9 inches on either side; so that for a trench requiring for its full depth (say) three frames of timber, an additional width at the top of about 3 feet must be allowed. When, however, the bottom excavation is in clay, it is often possible and even advisable, to narrow the trench, and cut a toe in the clay to give space for the footings. Timbering under such conditions is a comparatively simple operation; but when the soil happens to be loose, and especially if it be water-logged to any extent, it becomes a matter of very great importance. Stout struts and walings should be used, and the runners should be pitched close together all round. Moreover, the timbering requires to be constantly watched, and made secure against the slightest movement; for this, if allowed to extend, might result in disaster at any moment. It is not a pleasant experience, as I can vouch for, to be at the bottom of a trench some 30 or 40 feet in depth, and hear the timber creaking all around you; giving evidence of its being, as it is expressively termed, "all alive." This, when it occurs, denotes a critical period of the work; and the sooner it is past, the better for the peace of mind of all concerned.

As a preliminary to digging out the trench, it is necessary to get rid of the water, which may otherwise cause a suspension of the operations. With this object, a clear start should be made with the sump in which the pumps are to be placed. This should be situated as near as convenient to the site of the tank, and carried down at least 2 or 3 feet lower than the lowest part of the required excavation, which is at the point where the inlet and outlet pipes are intended to pass underneath the tank wall. Too much importance cannot be attached to this condition, or to its necessary corollary, which is that adequate and thoroughly reliable pumping plant must be provided. It is better to err on the safe side in both respects; because, unless you are completely master of the water, the chances are ten to one against your getting a perfect structure, if even the work be carried through without mishap. Instances might be multiplied of failure, or partial failure, from the neglect of one or other, or both, of what, in the light of experience, must appear to be very obvious precautions. But the following, which has been placed on record by Mr. George Livesey, M. Inst. C.E.,* is eminently typical. It relates to a tank 112 feet in diameter and 30 feet deep. Mr. Livesey says:

"In this case, two mistakes were made In the first place, the trench was set out of smaller diameter by 2 feet than the footings required, intending to cut away the earth (which was sand and gravel full of water) under and behind the bottom row of runners, in order to make room for the footings. This could not be done; and, as a consequence, the puddle at the back of the wall at the bottom was reduced to only 1 foot in thickness, which probably accounts for some of the leakage that for a long time took place in this tank. The other mistake in carrying out the work was the failure to sink the sump deep enough, and to provide sufficient pumping power. Had the sump been 3 feet deeper, it would have been in the chalk; and the pumps would have had to deal with clear water. Instead of this, the suctions were in a bed of running sand; and, as a consequence, an immense quantity of sand was brought up, resulting in the falling-in of the bottom of a small adjoining tank, in the cracking and settlement of the wall of a large coal-store, in the creation of great cavities in the earth in various directions, one being in a garden from 80 to 100 yards from the sump, and another in a public roadway about 40 yards distant. This last one was made known by the weight of a passing cart breaking the crust of the road, when the cart dropped in, fortunately without any serious consequences, beyond frightening the contractor and the Directors of the Company; and causing the excavation for the tank to stop 5 feet short of the proper depth, which brought the tank 5 feet higher than was intended. From the comparative shallowness of the sump and the deficiency of pumping power, the excavation was never properly cleared from water. Puddle was therefore put in under very unfavourable conditions. The tank could not be made tight; but it has been emptied two or three times for the purpose of trying to stop the leaks, and on the last occasion, in 1872, ten years after it was constructed, the leakage was reduced to a mere trifle, at which it has stood ever since. When this tank was made, the nature of the ground beyond 30 feet in depth was unknown. Had a boring been put down, the chalk would have been discovered a few feet lower, and some at least of these difficulties would have been avoided."

Water not unfrequently occurs in great abundance, and pumping then becomes a very serious item of cost. In the construction of a large tank at the Old Kent Road works of the South Metropolitan Gas Company, where water was met at a depth of 16 feet from the surface, the quantity which had to be pumped up every 24 hours is stated to have been about 2,160,000 gallons; while nearly 3,000,000 gallons per 24 hours were raised during the construction of the two large tanks at our Windsor Street works. It may happen also that the quantity to be dealt with is so large as to preclude the possibility of draining the site except at a cost that cannot be justified by the result. Such was the case recently with a very large tank at East Greenwich, undertaken by the South Metropolitan Gas Company, of which Mr. George Livesey is the Chairman. It is 250 feet in diameter, and was intended to have a depth of 60 feet; but, owing to the enormous quantity of water that found its way to the pumps (attributed to the near proximity of the River Thames), the excavation was reduced by 15 feet, the tank being completed with a depth of about 45 feet. Here the ultimate determination of the depth was a matter of calculation as to comparative cost and risk; but in another class of cases where the difficulty arises, not so much from its volume as from the obstinacy with which the water is retained in the soil, there is not the same room for choice.

It has fallen to my lot to have had much to do with the latter class; and my experience is that in ground more or less loose, through which water will not percolate freely, every foot of the excavation has to be won by perseverance, and a determination to overcome all obstacles. To this you must make up your mind, or else turn your attention to another site. What I may have to say in this connection possesses a local interest, and will be better understood if I begin by reminding you that the new red sandstone underlies a large portion of this district; cropping up here and there to within a few feet of the surface. It is to be seen at the foot of Gravelly Hill; there is a face of it exposed at Key Hill Cemetery; and it occurs, I believe, within a few feet of the surface underneath the building in which we are assembled. As will presently appear (from an example to which I shall have occasion to refer), it is most admirably suited for tank building, whether as a foundation or for the excavation; but, unfortunately for the coffers of the Gas Department of the Corporation of Birmingham, it is not available at the precise spot where its occurrence might have been the means of saving an outlay of many thousands of pounds. At Windsor Street, we happen to be situated on the edge of a very decided dip in this sandstone, which there forms a kind of valley filled up with drift deposit, consisting of fine sand, stiff and sandy loam, with a little fine drift coal, and occasional boulders, indicating glacial action. Water is found within a few feet of the surface; and thorough drainage, owing to the loamy nature of the soil, is a matter of peculiar difficulty. Nevertheless the site has been covered during the last ten years by works of a very heavy character, with scarcely a sign of settlement in any direction.

The first tank constructed in this ground, of which I am able to speak from personal knowledge, followed the one at Nechells, which was completed from my designs and under my superintendence in 1876, and is of the same size—viz., 200 feet diameter and 37 feet deep. These two, it may be remarked in passing, were the largest that had down to that time been undertaken in Birmingham. Some difficulty was experienced at Windsor Street in gaining the necessary depth, although the drainage was assisted by cutting a gap between the trench and the sump, through which was led to the latter all water that found its way into the trench from the back of the runners. The displacement of the soil, however, by this water was a serious matter for the timber, which sank repeatedly, and had to be constantly looked after. In addition, some trouble was caused at the outset from the bottom of the sump being in running sand, a great deal of which was drawn up by the pumps, until stopped by forming underneath the suction a kind of filter-bed made of straw securely timbered over

* See JOURNAL, Vol. XXXV., p. 1049; or Transactions of the British Association of Gas Managers for 1880, p. 126.

and wedged down. I do not offer any apology for mentioning these details, because, however trivial they may appear, it often happens that upon such the success or failure of an enterprise largely depends. Eventually a fairly good bottom for the tank was obtained, in the solid earth, with only here and there a soft place, which was carefully dug out and filled up with concrete.

When called upon, a year or two later, to construct two other tanks in close proximity to the one just referred to, but of much larger dimensions, I felt satisfied, from the experience already gained, that, with equally good drainage, there would be no difficulty in getting a firm foundation, without the necessity of having recourse to artificial means. Accordingly, operations were commenced with this end in view, but the greater area to be covered by the two tanks caused the drainage to be a far more formidable affair than was at all anticipated or could be foreseen, even from the nature of the ground. The first sump that was sunk did little or no good in reducing the water, but, on the other hand, a great deal of harm, by the quantity of very fine silt which was pumped up, and which no system of filtering that could be devised was effectual in keeping back; nor was it until after two more sumps were sunk, both reaching down to the sand rock more than 33 feet below the lowest level of the proposed excavation, that sensible relief was obtained. For a time all went smoothly enough. The water in the sumps was persistently kept down to the above level; and it was fondly imagined that the worst had been passed. Not so, however; for just as "bottoming up" had been commenced, and preparations were being made to lay the footings of the tank wall, the soil began to boil up in the trench, converting the bottom into a soft, sludgy mass. There was then no help for it but to prepare an artificial foundation; and this was done by taking out, in short lengths, an additional depth of 2 ft. 6 in., covering the bottom with a double thickness of 3-inch elm planking, and filling up on the top of this with 2 feet of Portland cement concrete. To enable this to be done, and also as a security against "kicking" during the excavation of the interior, sheet piles, of 9 in. by 4 in. deals, pitched close together, were driven to a depth of about 9 feet on both sides of the trench all round. Much of this artificial foundation had to be formed in water; the water being baled out by one set of men while another set laid the planking and filled in the concrete on the top of it. In the result, and notwithstanding all drawbacks—imperfect drainage, the men often having to work up to their knees in "slush," the timber having to be "jacked up" every few hours, night and day, and repeatedly strengthened to keep it safe—a perfectly solid and unyielding foundation was formed. The best proof of this is afforded by the fact that the greatest settlement after the erection of the tank walls 55 feet in height, inclusive of footings, did not exceed ¾ inch.

As showing how essential it is to secure an absolutely reliable foundation, mention may be made of a tank constructed a few years ago in somewhat similar ground, which, when the interior excavation had been got out, became almost a total ruin.

In striking contrast to this by no means exhaustive description of the Windsor Street tanks, I may refer to a tank (fig. 3) constructed for the Liverpool United Gaslight Company by Mr. William King, M. Inst. C.E., their Engineer.* It is wholly in the porous sandstone; the interior being left standing as shown, with only a slight covering to make it water-tight. The trench was excavated to the exact width required for the finished work, no timber being necessary; while, also, from the comparative absence of water, little, if any, pumping could have been needed. It would be difficult to find anywhere a parallel to such great natural advantages as are thus implied.

(To be concluded.)

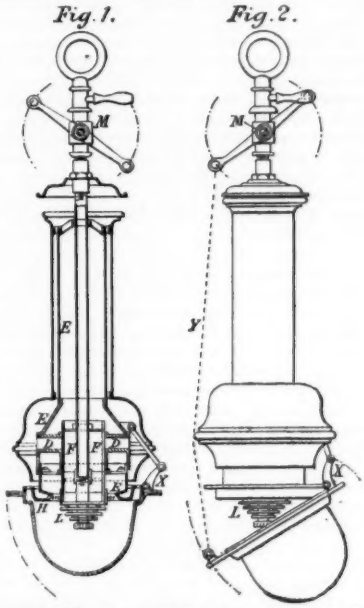
SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.—Notices for the meeting of this Association have just been issued by the Honorary Secretary (Mr. N. H. Humphrys, of Salisbury), from which we learn that the members and friends are invited to assemble at Bridgwater on Tuesday next. After an inspection of the gas-works in the forenoon, luncheon will be provided at the Royal Clarence Hotel. A return to the works will then be made, and Mr. J. H. Cornish, the President, will open the business at 2.30 p.m. In the course of the usual routine matters, the meeting will be invited to elect seven new members—a number equal to that added to the list at the last meeting. After the usual Inaugural Address, Mr. J. J. Jervis, of New Swindon, who is a prolific contributor to the proceedings of the Association, will submit the following question for discussion:—"To what extent are the advantages claimed for separate sections of hydraulic main realized in practice?" We believe that separate sections have been tried in this as in most other districts for a sufficient time to allow of sound practical information in answer to the question being forthcoming. It is one, moreover, on which different opinions exist, and so the result should be a good discussion. Mr. H. Sainsbury, of Trowbridge, the Past-President of the Association, is to follow with the subject of "Scurfing retorts"—a detail apparently simple, but having an important bearing on the wear and tear account in the retort-house. The last subject on the list is a paper on "Tar firing," by Mr. J. Thomas, of Bodmin—a gentleman known to be of an investigating and inventive turn of mind. The usual formal dinner at the close of the proceedings is to be dispensed with on this occasion, as it is considered that the railway accommodation, &c., will necessitate the early departure of several members.

* This was illustrated in the JOURNAL for June 24, 1884, p. 1146.

Register of Patents.

REGENERATIVE GAS-LAMPS.—Fullford, E., of Clapton, N.E., and Laun, H. T. van, of Lancaster Road, Notting Hill, W. No. 2853; Feb. 25, 1888. [11d.]

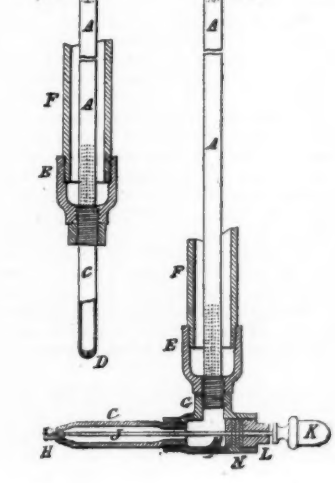
This invention of regenerative gas-lamps relates to the arrangement of the parts of the lamp by which air is supplied to the flame, so that "it is more easily and readily lighted when required, without the risk of explosion of the gas and air in the glass globe."



The gas is supplied down a central pipe to a burner at its lower end, contained in a glass globe; air being admitted above the flame through a number of openings D in the side of a tubular chimney E surrounding and concentric with a smaller inner air-pipe F down the centre of which the gas supply-pipe passes. These openings or passages pass transversely through the space between the chimney and the inner pipe, so that the heated air and products of combustion flow between and round the passages as they ascend the chimney; the air thus admitted passing down the central air-tube, and thence through the spaces between a conical set of plates L to the upper side of the flame. Air is also admitted to the outer or lower side of the flame through holes in a hollow annular chamber H surrounding the chimney; the air being admitted through holes upon its upper surface to this annular chamber, which also serves to carry a hinged ring to which the glass below the light is fixed. The hinged frame of the glass is provided with a lever X connected to the chimney E; so that, when the frame is opened to light the gas (as shown in fig. 2), the chimney is raised, and the air passages D are closed so as to shut off the air supply until the frame is again closed. The frame is connected by a chain or wire Y with a lever upon the gas-cock M; so that, when the globe is opened as just described, the gas is automatically turned on.

TAR-BURNERS.—Burtonshaw, T., of Chipping Norton. No. 3423; March 6, 1888. [8d.]

This tar-burner consists of a piece of thin brass tube A—12 to 18 inches long, and about ⅜ inch diameter—pierced on its sides with a large number of small holes. One end of the tube is closed by a cap B;

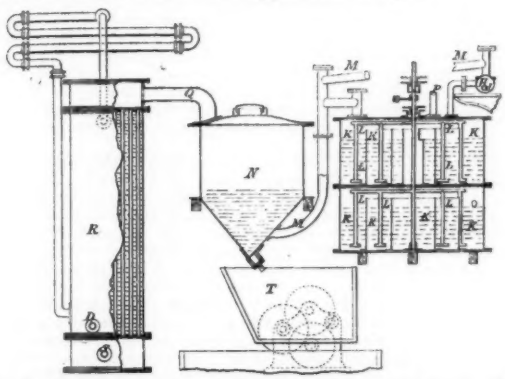


while to the other end is screwed a piece of iron tube C about 4 or 5 inches long, and of equal external diameter, the extreme or outer end D of which is contracted. Into this end a little molten lead is run; and centrally through the lead a fine hole is drilled. The lead enables this hole to be easily and quickly made the necessary size either by rimering larger or burring up smaller. It must never, however, be made quite so small as the holes in the brass tube. The combined tube is then thrust through a reducing-socket E, so that the 4 or 5 inches of iron tube projects beyond the small part of it; and it is fixed thereto by screwing or otherwise. The portion of the tube just described is inserted into an iron tube F, of considerably larger diameter, with a thread on its end on to which the reducing-socket is screwed. The large iron tube F with its brass tube inside is then connected to the tar-delivery pipe which is furnished with a cock; the whole being hung so that the nozzle stands in front of the frame of the furnace-door, but so that it may be turned up or on one side while the retorts are being charged.

In fig. 2 the socket E which receives one end of the brass pipe is connected to a reducing T-piece G by screwing; and into the latter is screwed the delivery-pipe C. The extremity of this pipe C has a metal nipple H screwed into it; and through the centre of the nipple a small hole is drilled. The size of the aperture is regulated by thrusting forward, or drawing back, the needle J by means of the knob or handle K. The needle works through guides L and M with asbestos packing N between them.

Treating Ammoniacal Liquor.—Green, H., of Preston. No. 3428; March 6, 1888. [8d.]

This invention has for its object to provide simple apparatus, constructed at moderate cost, for treating ammoniacal liquor.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[*We are not responsible for the opinions expressed by Correspondents.*]

THE POSITION OF THE GAS INSTITUTE.

Sir,—Some years ago, when The Gas Institute was known as the British Association of Gas Managers, I advocated the claims of our profession to a more worthy title and a higher status of membership, having in mind the Institution of Civil Engineers (who are a governing body with a chartered organization and an examining board), membership of which is a guarantee that the candidate has had a practical training, or has shown a due capacity for the profession it represents Such membership is a guarantee of fitness, and an honour to those obtaining it, and is respected alike by all, both inside and outside their profession. Shortly afterwards (not as the result of my advocacy) the British Association of Gas Managers became converted into The Gas Institute; and in their desire to include all, and make the door wide enough, there has been too little "wall" left; and consequently at the first serious blast the building collapsed. It always was a mongrel Institute, at any rate; allowing its examiner to be appointed by another organization, conferring no degree, and its membership no honour nor even title of fitness for the profession it embraced. However, the foundations are left; and it remains to be seen what sort of new superstructure shall or can be erected thereon. Until I see the plans of the new edifice, I mean to retain my membership there; and if such an organization can be raised as the one sketched above, none will rejoice more in its success than I. I have joined the new Provisional Committee, however, because I wish to see such an organization germinated, and think there is more prospect of its successful achievement where the ground is clear and not restricted for space. I think every one must admit that the most competent and eminent representatives of gas engineering—not in England alone, but throughout the three kingdoms—have (with one exception) seceded from The Gas Institute; and unless some means of retaining or regaining their membership can be devised, the Institute will cease to be representative of the gas industry. If governed by mediocrities, it can be of little honour and less instruction to any of its members.

Longwood, March 2, 1889. Neill Meiklejohn.

THE DINSMORE GAS PROCESS.

Sir,—When perusing the interesting Inaugural Address of Mr. John Somerville, as President of the Southern District Association of Gas Engineers and Managers, delivered at the recent annual meeting of the Association, I noticed that in one part he alluded to the Dinsmore process, and said he thought such high results as were stated—viz., 2500 extra cubic feet of 21-candle gas which the tar from a ton of coal is said to produce by that process—required some explanation. I see that the process is referred to in the current issue, by Mr. Charles Taylor, in his Presidential Address at the meeting of the Midland Association at Birmingham. He says: "The Dinsmore process is advertised as being capable of giving 12,254 cubic feet of 22·16-candle gas from 20 cwt. of Arley Mine nuts and 7 gallons of tar. It remains to be proved whether these figures can be relied upon in ordinary practice, and whether the process involves the formation of naphthalene to a greater or less extent than is found in our ordinary method of working." Then Mr. Taylor quotes Mr. L. T. Wright's statement that tar produced from ordinary coal contains only 5 per cent. of substances having positive value as materials entering into chemical combination, and says: "If this be so, it is difficult to understand how 7 gallons of tar can be so far utilized in the Dinsmore process as to produce an increased yield of over 2000 cubic feet of gas per 20 cwt. of coal." Both gentlemen are quite right in wishing for an explanation; and this I will endeavour to give as briefly as possible.

Before doing so, however, I beg leave to substantiate the statements already made as to the results obtained in the practical working of the process, and further to say this: That still higher results, both in quantity and candle power, can be maintained by the distillation of all the tar yielded from each ton of coal; also that the gas is more permanent than that produced by the ordinary method. That (not only as a reasonable deduction, but as a fact proved beyond dispute) it leaves no deposit in the mains or pipes. That in its crude state it contains less sulphur—notably that carbon bisulphide is almost or entirely absent. That no pitch is produced or found in any part of the apparatus for distillation or purification, or in the mains or pipes leading thereto; the residue from the distillation of the tar being, as stated, a dry coke of no great quantity, but of greater specific gravity than that produced in the ordinary retorts, and containing about the same proportion of sulphur, which accounts for the less quantity found in the crude gas. That there is no naphthalene produced. That there is no extra cost in labour over the ordinary method. That in the erection of new benches of retorts for the process, the first cost will not exceed the first cost of the ordinary method. That the value of the bye-products is about the same. I wish it to be implicitly understood that these statements are not made under any mental reservation—that there is no detracting qualification of which I am aware, and wish to suppress by failing to mention it. The process is now before the gas world, and, so far as it has been in practical operation, has substantially proved what I here have stated.

Some 28 years ago I made and erected a miniature gas plant for supplying my father's workshop and also the dwelling-house. Experimenting with the tar, I then came to the conclusion that the production of this substance in the manufacture of gas was simply a defect in the process of distillation; and I think so still.

The Dinsmore process is accomplished by the substitution of a specially formed retort in place of the centrally placed retort in a bench of fives or of sevens, through which all the gas collected in the hydraulic main from the other retorts is caused to pass, and into which part of the tar from the main is caused to flow in a regulated quantity and by a sight-feed. This tar falling on the bottom in the hottest part of this special retort (called the "duct," for distinction) is gasified, and is absorbed by the passing gas from the other retorts. This duct being as hot as the other retorts, the gas is subjected to the same heat as it received in the other retorts; thus forming with the tar a homogeneous and permanent mixture. The gas leaves the duct by a water-jacketed pipe placed vertically at the end thereof, and not less than a certain length, by which the moisture and the heavier portions of the tar are extracted from the gas, and fall back into the duct continuously, and as continuously convert a portion of that tar or pitch into gas. In the meantime the gas is so reduced in temperature by passing through the cooling-pipe, that further evaporation of and thickening of the accompanying tar is prevented; thereby keeping the foul main as clear as in the ordinary process. The tar arrested by condensation at the condensers and elsewhere is somewhat thinner in consistency than ordinary tar.

The reason why such great additional results are obtained by the Dinsmore process is owing to the tar being distilled in presence of, and in combination with the gas, at a temperature equal to that which developed the gas in the ordinary, or primary retort, and having the hydrogen of the gas to absorb all the soluble carbon and the hydrocarbons of the tar; for be it remembered that *all the pitch*, which is a pure carbon, is absorbed by the hydrogen—nothing but the dry coke being left in the duct. Here, then, it is at once shown that the tar distiller's calculations do not apply, and, standing on an entirely different basis, should not be quoted; as from every 112 lbs. of tar there are produced about 60 lbs. of pitch, which after the distillation of the tar he has still as pitch, whereas in the Dinsmore process both the pitch and the tar are absorbed entirely by the hydrogen of the gas.

Independently of the additional gas produced by the tar supplied to the duct, there is a still further gain, not hitherto alluded to, but which forms an important portion of the total gain. It is that which is produced by the fixing of the imperfectly distilled gas coming from that part of the charge of coal (during the first hour) that is nearest the mouthpiece of every retort. This in passing through the duct becomes permanent gas; also a portion of the moisture which accompanies all the gas through the duct is converted into hydrogen—adding still further to the quantity. I would here mention that if the gas from the retorts were allowed to pass through the duct, and the supply of tar withheld from it, the effect would be that (say) 20-candle gas would be reduced to perhaps 14-candle gas, according to the heat of the duct. There is no fine point regarding the proportion of tar supplied to the duct; only if it be overdone the heat will go down, and then both quantity and candle power will be diminished.

It has been often said and upheld as an indisputable fact to show that the Dinsmore process cannot be as good as we claim it to be, "that the tar produced from a ton of coal will only yield from 500 to 600 cubic feet of 14-candle gas," Just so. By that particular method of distillation, that would be about all; and if a more stupid method for producing gas from tar could be adopted, the results would be perhaps still lower. What better results could accrue when they first separate the gas with its hydrogen from the tar, and then by a subsequent distillation expect the hydrocarbons of the tar, in the absence of the hydrogen, to support or absorb the hydrocarbons? The result is that the greater part of the distilled tar will condense and resolve into tar again, only the tar would be thicker, and, in the absence of the water-jacketed pipe, would deposit itself in a rapidly-increasing body along the pipes; and although the gas at its genesis would be rich in hydrocarbons, the thick coating of tar in the pipes would prove the affinity of like for like by absorbing the hydrocarbons from the gas in its passage through the pipes, and so produce the miserable results which are upheld as a standard by which any newer process should be judged.

This process should not be confounded with those of Dr. Eveleigh and others, who have vainly attempted to carburet gas with tar vapours. My experience is that coal gas can only be carburetted successfully with tar vapours by the Dinsmore process, to produce a permanent gas—that is, the mingling of tar vapours and gas accompanied by moisture in the presence of a heat equal to that which generated and sent forth from the retort a permanent gas.

Liverpool, March 2, 1889. J. H. R. Dinsmore.

DESIGNING GASHOLDERS.

Sir,—In your recent criticism on the Sydney gasholder articles, you drew attention to the advisability of gas companies avoiding contractors, and going to independent gas engineers for their advice and plans. With this I thoroughly agree—not altogether for the reasons you give, but for the following.

1. If the engineer or manager of a gas-works applies to any particular firm of contractors for a design for a new gasholder, he necessarily feels under an obligation to that contractor to do his utmost to secure him the order.

2. He is tempted, therefore, in case that contractor's tender is not the lowest, to press his committee to accept it, although he may know that the firms tendering lower prices would give an equally good job.

3. If he applies to several contractors for designs, tenders, and specifications, he does worse still, because one tenders against the other, and there is anxiety on their part to outdo one another in making the holder light, to get the price down. The result is that a light, and possibly weak holder is more likely to be adopted than a good substantial and durable one. Of course, if the engineer of the gas-works is able to judge of the merits of the various designs, and advises accordingly, and can convince his committee, moreover, that his advice is unbiassed and sound, he would not run this risk. But then, if he is able to do this, he could design the holder himself, instead of putting himself under obligations to contractors.

4. As the writer of the article points out, contractors follow precedence,—they "run in ruts" and work by "rule of thumb." They are so intensely "practical" that, immediately anything new or an improvement is proposed, they denounce it as "theory," no matter how practical the proposer may be.

5. Gas engineering is a profession, the dignity of which should be maintained. This cannot be done by substituting contractors for consulting gas engineers of wide experience and training.

6. Gas companies do well to employ men as managers of their works who have had a thorough engineering training; and preference should be given to those who are able to carry out extensions from their own plans. If they cannot do this, the wisest course is to go to an experienced consulting gas engineer.

Having said so much in support of the views expressed in the article,

there are a few matters upon which, from an engineer's point of view, I cannot quite agree with you.

1. Speaking of Piggott's bent cups, the writer admits that they are not so strong or stiff as the ordinary channel-iron cups; but he mentions the old argument about riveting—viz., that the bent cup has less riveted joints. This is a question. In bent cups, the ring is formed of a multitude of plates, not exceeding 5 feet, and often only 4 feet long. This means a vertical riveted joint not only on the outside of the holder, where it is easily got at, but right under the bend and up under the dip, where it cannot be got at if it leaks. In the channel-iron cups, however, the "cup" and "dip" plates (*i.e.*, the inside plates) are long—often 16 feet from joint to joint. Then, again, the channel iron forming the base is in long lengths of 28 or 30 feet; so that the base of the cup (corresponding to the bend in the bent cups) only has a cross joint every 30 feet, instead of (say) every 5 feet. I am, of course, aware that there is the ring of rivets round the channel iron; but the bent cup is not all gain, even on the score of riveting, as anyone reading the article might be led to suppose. The following argument may be added to those given by Messrs. Walker in favour of channel-iron cups: In the bent cup, the joint of plate forming the outside, inside, and base is all in one place; whereas in the channel-iron cup the outside plate, the inner plate, and the channel iron all *break joint* with one another. The bent cup is like a plate girder, having the top flange, bottom flange, and web all jointed in one place—in one cross section—instead of breaking joint as they should do. In my opinion, after taking everything into consideration, the channel-iron cup is far better than the springy bent cup.

2. All practical engineers would see the advantage, on the score of appearance, as well as facility of doing the work, of making the sides in "bays." It does not follow that, because the stays and guides are "loose," the sides should not be made in bays.

3. The diagonal ties take hold of the front member, because in this particular gasholder they are vastly more effective (looking at gasholder guide-framing as a cylinder) than they would be if they took hold of the back member.

4. Wire rope, in my opinion, is not so good as rods, which can be attached firmly to every alternate standard.

LIVE AND LET LIVE.

March 1, 1889.

THE SPECIFIC GRAVITY AND ILLUMINATING POWER OF GAS.—A "Student" writes: "Will any of your readers kindly inform me if there is any definite relation between the specific gravity and the illuminating power of gas, also what is the specific gravity of London gas, as I have only succeeded in getting very discordant results as compared with the specific gravity tables in Mr. Newbigging's 'Handbook.'"

TENBY WATER SUPPLY.—An inquiry was held last Saturday week, at Tenby, by Colonel W. M. Ducat, R.E., one of the Local Government Board Inspectors, into an application by the Corporation to borrow £3186 for works of water supply. No opposition was offered to the proposal

IMPROVED LIGHTING AT EXETER.—At a meeting of the Exeter Town Council last Wednesday, a letter was read from the Secretary of the Exeter Gas Company (Mr. W. A. Padfield), offering, on behalf of the Company, to increase the lamps in the principal streets, and provide better burners in certain lamps indicated, and yet supply the gas at a lower price, which would result in a saving of £77 13s. 3d. per annum, provided a seven years' contract were entered into. A general feeling was expressed that, as matters now stand with regard to public lighting by electricity, it would be better not to enter into a contract for longer than three years; and a resolution to this effect was adopted.

PROPOSED NEW WATER-WORKS FOR STAINLAND.—Last Saturday week an inquiry, respecting an application by the Stainland Local Board to borrow £10,000 for new water-works, conducted by Mr. Arnold Taylor on behalf of the Local Government Board, was concluded, after having extended over four days. The scheme which the Local Board have adopted is one prepared by Mr. G. H. Crowther, of Huddersfield, for impounding water from springs at Coldacre Edge in a reservoir to hold 44 million gallons. There was strong opposition to the project; and, in the course of the inquiry, it was definitely stated that the rights of the Board to take the water in question would be contested.

SOUTH ESSEX WATER COMPANY.—The accounts of this Company for the past half year, which were submitted at a meeting of the shareholders last Thursday by the Chairman, Mr. W. Cracroft Fooks, Q.C., show a net profit of £2532. During the six months 254 new services were added. Applications amounting to £2250 of stock, in the proportions of 60 per cent. preference and 20 per cent. ordinary, were received, and allotments made. The balance at the profit and loss account, after deducting interest upon the debenture stock, was £4586. The Directors recommended the payment of a dividend of 5 per cent. upon the preference stock, and at the rate of 15s. per cent. per annum upon the ordinary stock. The Chairman, in moving the adoption of the report and accounts, said he thought they showed that the concern was progressing. They had derived considerable advantage from the works last constructed; and they also expected much benefit from the works they had in contemplation. Mr. J. C. Amos, in seconding the motion, made a detailed statement regarding the accounts and the position of the Company. The resolution was adopted.

THE MANAGEMENT OF THE SALTLEY (BIRMINGHAM) GAS-WORKS.—A meeting of the Gas Committee of the Birmingham Corporation was held yesterday week—Alderman Pollack presiding. The Committee spent a considerable time in considering the matters raised at the last meeting of the Council upon the resolution for increasing the salary of Mr. Henry Hack, the Engineer of the Saltley works (see *ante*, p. 399). The Chairman and Mr. Manton reported the results of their preliminary investigation at the works on the previous Friday. It was thought advisable, however, that an opportunity should be given to Messrs. Bloor and Granger to attend a meeting of the Committee, and state more fully the matters which they desire should be investigated, and the form the inquiry should take. The meeting was therefore adjourned until Thursday, when Messrs. Bloor and Granger were present. After a prolonged discussion, it was decided that the Committee should hold a personal inquiry at the Saltley works last Saturday morning. The inquiry was arranged to be strictly private. The matters investigated were those stated by Mr. Eli Bloor in his speech in the Council, and include allegations of continued reductions of wages, additional amount of work without increase of payment, excessively long hours in some departments, and general "tyranny" in the management. Mr. Edwin Smith, the Secretary of the Department, made an announcement that "the workmen who desire to give evidence in the inquiry will be assured that their position shall be in no way prejudiced by any evidence truthfully given."

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, Feb. 25.

The LORD CHANCELLOR acquainted the House that the Examiners had certified compliance with the Standing Orders in the case of the following Bills:—Barrow Hæmatite Steel Company (Water) Bill, Barrow-in-Furness Corporation Bill, Barrow and Cadoxton Gas and Water Bill, Belfast Water Bill, Bristol Water Bill, Burnley Corporation Bill, Bury Corporation Bill, Cheltenham Improvement Bill, Cleveland Water Bill, Coventry Corporation Water Bill, Deanhead Commissioners Bill, Eastbourne Water Bill, East Kent District Water Bill, Edinburgh and District Water Bill, Faversham Gas Bill, Garw Water Bill, Great Wigston Gas Bill, Heywood Corporation Bill, Hythe Corporation Bill, Kettering Water Bill, Liverpool Corporation Bill, London Hydraulic Power Company Bill, Long Eaton and District Water Bill, Metropolitan Electric Supply Bill, Morley Gas Bill, Newcastle and Gateshead Water Bill, Newry Improvement Bill, Padiham and Hapton Local Board Bill, Plymouth Dock (Devonport) Water Bill, Rastrick Water Bill, Rickmansworth and Uxbridge Valley Water Bill, Scarborough Improvement Bill, South Kent Water Bill, Swansea Corporation Bill, Tunbridge Wells Improvement Bill, Tuscan Gas Bill, Wakefield Corporation Bill, West Ham Gas Bill, Wigan Borough Extension Bill, Windermere District Gas and Water Bill, Woodhall Spa Company Bill, and the Yeadon Water Bill. [With one exception—the Huddersfield Corporation Bill—these are all the Bills in which our readers are interested, for which notices were given in November last, as epitomized in the JOURNAL for Dec. 4, 1888.—ED. J. G. L.]

TUESDAY, FEB. 26.

The following Bills were presented, read the first time, and referred to the Examiners:—Bristol Water Bill, Cleveland Water Bill, Eastbourne Water Bill, Newcastle and Gateshead Water Bill, Plymouth Dock (Devonport) Water Bill, Tuscan Gas Bill, Windermere District Gas and Water Bill, Yeadon Water Bill.

The following Bills were presented and read the first time:—Belfast Water Bill, Burnley Corporation Bill, Bury Corporation Bill, Deanhead Commissioners Bill, Hythe Corporation Bill, Newry Improvement Bill, Padiham and Hapton Local Board Bill, Wakefield Corporation Bill.

THURSDAY, FEB. 28.

The Coventry Corporation Water Bill was presented, and read the first time.

FRIDAY, MARCH 1.

The Barry and Cadoxton Gas and Water Bill and the Rastrick Water Bill were presented, read the first time, and referred to the Examiners.

HOUSE OF COMMONS.

MONDAY, FEB. 25.

The petitions were presented for the following Bills, which were ordered to be brought in:—

Barrow Hæmatite Steel Company (Water) Bill, by the Marquis of Hartington and Lord Edward Cavendish.
Barrow-in-Furness Corporation Bill, by Mr. Caine and Mr. S. Gedge.
Cheltenham Improvement Bill, by Mr. Agg-Gardner and Sir J. Dorington.
East Kent District Water Bill, by Major Dickson and Mr. Gurdon.
Edinburgh and District Water Bill, by Mr. Childers, Mr. Wallace, Mr. Buchanan, and Mr. Munro Ferguson.
Faversham Gas Bill, by Mr. Knatchbull-Hugessen and Sir Roper Lethbridge.
Garw Water Bill, by Mr. C. Talbot and Mr. A. Williams.
Great Wigston Gas Bill, by the Marquis of Granby and Mr. Tapling.
Heywood Corporation Bill, by Mr. Hoyle and Mr. Leake.
Kettering Water Bill, by Lord Burghley and Sir R. Knightley.
Liverpool Corporation Bill, by Mr. Whitley and Mr. Royden.
London Hydraulic Power Company Bill, by Sir F. Mappin and Mr. Wiggin.
Long Eaton and District Water Bill, by Mr. Compton Lawrance and Mr. Smith Wright.
Metropolitan Electric Supply Bill, by Sir R. Fowler and Sir G. Elliot.
Morley Gas Bill, by Mr. G. W. Balfour, Mr. E. W. Beckett, and Mr. Milnes Gaskell.
Rickmansworth and Uxbridge Valley Water Bill, by Sir F. Mappin and Mr. Wiggin.
Scarborough Improvement Bill, by Mr. E. Beckett and Mr. Rowntree.
South Kent Water Bill, by Mr. Jarvis and Mr. Tapling.
Swansea Corporation Bill, by Mr. Dillwyn and Mr. Randell.
Tunbridge Wells Improvement Bill, by Mr. Norton and Colonel Brookfield.
West Ham Gas Bill, by Mr. Forrest Fulton and Mr. Staveley Hill.
Wigan Borough Extension Bill, by Mr. Powell and Mr. Tomlinson.
Woodhall Spa Company Bill, by Mr. E. Stanhope and Mr. Chaplin.

TUESDAY, FEB. 26.

The following Bills were presented, read the first time, and referred to the Examiners:—Barrow Hæmatite Steel Company (Water) Bill, Faversham Gas Bill, Garw Water Bill, Great Wigston Gas Bill, Kettering Water Bill, London Hydraulic Power Company Bill, Metropolitan Electric Supply Bill, Morley Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, West Ham Gas Bill.

The following Bills were read the first time, and ordered for second reading:—Barrow-in-Furness Corporation Bill, Cheltenham Improvement Bill, East Kent District Water Bill, Edinburgh and District Water Bill Heywood Corporation Bill, Liverpool Corporation Bill, Long Eaton and District Water Bill, Scarborough Improvement Bill, South Kent Water Bill, Swansea Corporation Bill, Tunbridge Wells Improvement Bill, Wigan Borough Extension Bill, Woodhall Spa Company Bill.

METROPOLIS WATER SUPPLY.

A Bill for "enabling the County Council of London to introduce new supplies of water into the Metropolis, and to acquire the rights of existing Water Companies," was brought in by Mr. O. V. Morgan, Mr. S. Buxton, Mr. Causton, Mr. Cremer, Mr. Howell, Mr. Lawson, Mr. Montagu, Mr. Pickersgill, Mr. J. Rowlands, and Mr. J. Stuart, read the first time, and ordered to be read a second time on Wednesday, April 10.

THURSDAY, FEB. 28.

WEIGHTS AND MEASURES.

A Bill for "amending the law relating to weights and measures, and

for other purposes connected therewith," was brought in by Sir Michael Hicks-Beach and Baron Henry De Worms, read the first time, and ordered for second reading on Monday, March 4.

PRIVATE BILL LEGISLATION.

In answer to Mr. CRAIG-SELLAR,

Mr. W. H. SMITH said it was the intention of the Government to introduce a measure dealing with Private Bill Legislation, based on the report of the Joint Committee of last session.

Mr. CRAIG-SELLAR gave notice that on Tuesday, March 5, he would ask leave to bring in a Bill for establishing a Commission to examine and report on Private Bills in Parliament, and matters relating thereto.

LIGHTHOUSE ILLUMINANTS.

Mr. T. W. RUSSELL gave notice of his intention to move, on Monday, March 4, for a copy of memorials from shipowners of various ports in the United Kingdom with the signatures thereto, asking for further inquiry into the report of the Trinity House on the South Foreland Experiments on Lighthouse Illuminants, and addressed to the Marquis of Salisbury as Prime Minister, and by him referred to the Board of Trade; and also the correspondence which has taken place on the subject between the Board, the Trinity House, Professor Stokes, M.P., President of the Royal Society, and Mr. J. R. Wigham on his own behalf, and on behalf of shipowners and others interested in the question (in continuation of Parliamentary Paper No. 70 of last session). The honourable member also notified his intention of previously asking the President of the Board of Trade whether he would consent to the motion.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

TUESDAY, FEB. 26.

(*Before Lords Justices* COTTON, LINDLEY, *and* LOPES.)

In re AN ARBITRATION BETWEEN THE YEADON LOCAL BOARD AND THE YEADON WATER-WORKS COMPANY.

This was an appeal by the Yeadon Water-Works Company to have a judgment delivered by Mr. Justice Kay on the 2nd of November last (and reported in the JOURNAL for the 6th of that month), refusing to set aside an award made in an arbitration between the Company and the Yeadon Local Board, reversed, on the ground that the award was not made within the time required by section 180 of the Public Health Act, 1875, under which it was held, and was therefore bad; and that the Umpire, in making the award, had not based it on the differences referred to arbitration—viz., whether it was reasonable for the Local Board to require the Water Company to supply water at the rate of not less than 20 gallons per day for each person residing in every house within the urban sanitary district of Yeadon. The Company was incorporated in 1870; and the Local Board of Health for the Yeadon district, in the year 1887 (which, it was alleged, was a time when there was a great deficiency of water all over England), applied to the Company, by a formal notice under the Public Health Act, calling upon them to provide water "suitable and proper for drinking and ordinary domestic purposes" to each house in the district supplied by them, at the rate of not less than 20 gallons per day for each and every person. The Company did not comply with this notice. There had been negotiations for the purchase of their works; but the terms had not been arranged. In December, 1887, the Local Board gave notice of the appointment of an Arbitrator with reference to the question of water supply; and later in the same month the Company did the same. The Arbitrators met, but could not agree; and accordingly they appointed an Umpire, whose award it was that the Judge in the Court below had held to be good, and which was now objected to.

Sir HORACE DAVEY, Q.C., Mr. RENSHAW, Q.C., and Mr. EYRE appeared for the appellants; Mr. RIGBY, Q.C., Mr. MARTEN, Q.C., and Mr. PROCTOR for the respondents.

The arguments, which were opened on the previous Friday, were resumed to-day; it being contended, on behalf of the respondents, that, according to the true construction of section 180 of the Public Health Act, the Umpire was allowed an extra 21 days, beyond the two months granted to the Arbitrators, wherein to make his award.

At the close of the arguments, their Lordships gave judgment.

Lord Justice COTTON said that the words in the first part of sub-section 9 of section 180 of the Act of 1875, which referred to the extension of time for making their award by arbitrators, were necessarily intended to extend the original limit of time in the case of arbitrators at all events, and that a different meaning could not properly be given to the very same words with reference to an umpire in the second part of the same sub-section. The words of the second part therefore necessarily implied that there was an original limit of time within which an umpire should make his award; otherwise there would have been no necessity to provide for an extension of time. His Lordship, however, could not find any original limit fixed for an umpire in sub-section 6 of section 180, and did not think that the term "single arbitrator" used in that sub-section referred to an umpire. Though, with respect to an umpire, there was no clause in the Act expressly fixing an original limit of time for his making an award, it was clear that the framers of the Act thought there had been an original limit of time fixed; and he therefore considered the Court would be right, acting by analogy to the case of arbitrators, in holding that the original limit of time for an umpire to make his award was 21 days from the date of his appointment. As to the date when the matters were referred to the umpire, it had been urged on behalf of the respondents that the only possible reference here was when there had been a neglect by the arbitrators to exercise their powers—viz., on Feb. 20, 1888, when their extended time expired. But, in his Lordship's opinion, there might lawfully have been a reference to the Umpire before that period, and on the evidence it seemed to him that there had been a reference of the matters to the Umpire on Feb. 1, 1888. The evidence showed that one of the arbitrators withdrew from the meeting held on that date, and said he would not go on with the matter. Even if the Umpire had a period of two months for making his award, the time ran from Feb. 1, 1888, and therefore the award made on April 19 was out of time.

Lords Justices LINDLEY and LOPES concurred.

The appeal was therefore allowed, with costs.

GREENWICH POLICE COURT.—TUESDAY, FEB. 26.

(*Before Mr.* FENWICK.)

CONVICTION FOR STEALING GAS.

To-day *Walter James Watts*, a boat builder, residing at No. 7, Thames Street, Rotherhithe, was charged with stealing a quantity of gas valued at £1, the property of the South Metropolitan Gas Company.

Mr. WASHINGTON appeared for the prosecution; Mr. HOLMES MOSS defended the prisoner.

Mr. WASHINGTON said the prisoner had occupied the premises in question for about four years; and the Company had a very strong impression that he had been burning gas for this period without paying for it. Acting on information, a watch was kept on the premises, with the ultimate result that the prisoner was arrested. The gas was cut off five years ago at the wish of the former occupier; and no request had been made for a re-connection.

Mr. C. Howard, the Company's Chief Inspector, deposed to visiting the premises in question on the 8th of February, and seeing a strong light burning. Having been admitted by the prisoner, he found two large gas-jets burning on the lower floor, and three on the upper floor, one of which had no nipple, and the gas was flaring with a flame fully a yard long. He estimated that the value of the gas burnt by the prisoner would be 7s. or 8s. per week. The connection was made on the ground floor, and gas was passing into prisoner's fittings by means of 1¼-inch iron pipe, which had been affixed to the Company's service-pipe. The portion of pipe which prisoner had affixed passed by the meter-box, and where it should have entered the meter was concealed by two boards. The meter-box was locked, and there was no connection. The prisoner had not applied for a supply of gas for these premises since the service was disconnected in June, 1883. Prisoner admitted that he had been burning the gas since about last autumn. Supposing this to be so, the value of the quantity consumed would be about £7 or £8.

In cross-examination, witness said the prisoner stated that he found the gas on the premises when he entered them, and did not know of the connection having been made until some months after he came.

George Frederick Beverton, one of the Company's inspectors, who accompanied the previous witness, deposed to seeing gas burning.

Other witnesses (one in the prisoner's employ) having stated that they also had seen gas burning on the premises at various times,

Prisoner pleaded "Guilty," and elected to be tried by the Magistrate.

Mr. Moss said the prisoner's was a deplorable tale. He had been in a good way of business, and had a wife and seven children. The temptation came upon him, and he gave way to it.

Mr. WASHINGTON said that if the prisoner had been burning the gas since he entered the premises, upwards of £80 worth would have been consumed.

Mr. FENWICK sentenced the prisoner to six weeks' hard labour.

THE RASTRICK LOCAL BOARD AND THE WATER COMPANY'S BILL.—The Rastrick Local Board recently applied to the Local Government Board for sanction to oppose the Rastrick Water Company's application to Parliament for incorporation. The Clerk to the Board forwarded a copy of the Bill, together with the Board's statement of the position of affairs, and copies of resolutions passed by the Board, and also by a public meeting of ratepayers and property-owners. A reply has been received from Sir Hugh Owen sanctioning, on behalf of the Local Government Board, the Local Board's objection to the Bill.

THE PRICE OF GAS AT HARWICH.—Yesterday week, a public meeting was held at Harwich to protest against the high price charged by the Gas Company to private consumers in the borough. A resolution was proposed to the effect that all present should pledge themselves to dispense with the use of gas (as far as practicable) unless the Company consented to reduce the price to 4s. per 1000 cubic feet, and also to lower the charge for meters, and that a Committee be formed for the purpose of carrying such resolution into effect. The mover pointed out that the price of gas in Harwich was very high—5s. 10d. per 1000 feet. After some discussion, the motion was adopted, and a Committee was appointed to communicate with the Directors of the Company.

NORTHERN COAL TRADE.—There is a slight easiness in the coal trade of the North of England, both in steam coals and in gas qualities. Stormy weather preventing the arrival of steamers, has interfered with work at one or two collieries, but it is expected that there will be an early revival; whilst the South Wales miners' action may further influence prices. Best Northumbrian steam coals are from 10s. to 10s. 6d., and small coals vary from 2s. 6d. to 3s. per ton. In the gas coal trade there is a fair demand for the season, and some important contracts have now been decided on, or are under negotiation. For odd cargoes, about 7s. 9d. per ton free on board is asked. Household coals are easier; but there is a good demand for manufacturing coals. Gas coke is very steady.

LIVERPOOL CORPORATION WATER AFFAIRS.—The Chairman and Deputy-Chairman of the Liverpool Water Committee, and the Chairman of the Executive Sub-Committee, have been appointed as a Sub-Committee to meet a Committee representing the Darwen Corporation, as to the sale of the Upper Roddlesworth reservoir, and a portion of the watershed. Practically the proceedings between Mr. T. Hawksley and the Corporation, with reference to the work done by Mr. Hawksley at the Vyrnwy Water-Works, are now completed. A few trifling details arising out of the recent arbitrations have yet to be arranged; but it is stated that it may be definitely taken for granted that the costs to be paid by the Corporation will fall very far short indeed of £6000 or £7000—an estimate which has been erroneously mentioned in some quarters. It is reported that the Vyrnwy reservoir is now nearly half full of water, which is backing up the valleys. During the past fortnight hundreds of tons of soil have been daily rolling down the slopes into the lake, owing to the driving waves undermining the loose earth. The work of demolition is still going on.

THE FATAL ACCIDENT AT THE SWANSEA GAS-WORKS.—An inquiry into the circumstances attending the accident to John Thomas, who met with his death while engaged in the performance of duties at the Swansea Gas-Works (*ante*, p. 391), took place on Monday last week, before the District Coroner (Mr. E. Strick). John Castle, a foreman employed in the purifying-house at the gas-works—a position he had held about 20 years—stated that deceased had been in the employ of the Company seven years, and had all that time worked in the purifying-house. On the day in question, they were engaged in stopping a leak in a valve, by which there was an escape of gas. To do this they had to take out the packing which had been eaten away, and put in fresh. He had lifted out the gland, and the deceased was standing by on the platform with the oil and hemp ready to put in. The gas at once escaped. They put their hands on the spindle by which the valve was opened and closed to keep back the gas. The gas nevertheless took effect on both of them. It first made him (witness) drowsy; and then he felt sick and fell to the ground—about 8 feet. Before then he had noticed deceased falling down, and leaning against the pipe. Witness then became insensible. They performed a similar duty about once a week; but on this occasion the packing was more eaten away than usual. The gas was escaping before they touched the gland. To adopt any other mode of dealing with the escape, it would be necessary to stop the works. No want of care or skill caused the fatality. Dr. Hall said that when he saw deceased he was quite dead. He thought death must have been almost instantaneous, or else deceased would have fallen like the other man. A verdict of "Accidental death" was returned; and the jury asked the Coroner to recommend the Gas Company to see if any expedient could not be devised to prevent a recurrence of the accident.

Miscellaneous News.

THE BOARD OF TRADE REPORT ON THE GAS, ETC., BILLS AND ORDERS OF THE PRESENT SESSION.

The Board of Trade report on the Gas, Water, and Electric Lighting Bills and Provisional Order applications for the present session was issued last week. It shows that the number of Bills relating to the supply of gas is 10—all for England; six of them also containing provisions relating to the supply of water, and one to electric lighting. The capital proposed to be raised by these Bills is £359,820 by shares, and £152,133 by loans—total, £511,953. There are 35 Bills relating to water supply (one of them being for Scotland and one for Ireland); the total capital asked for being £1,410,800 by shares, and £1,171,700 by loans—total, £2,582,500. Provisional Orders to the number of 14 have been applied for in respect of gas and water supply (seven for each); and 17 in respect of electric lighting. The capital proposed to be raised under these Orders is: For gas, £139,883; for water, £73,250; for electric lighting, £998,000—total, £1,211,133. As compared with last year, there are six more Bills; the capital applied for being £273,311 more than in the session of 1888. Of the Provisional Order applications, there are seven more than last year—the 17 Electric Light Orders (of which there were none before) swelling the number; the capital proposed to be raised under them showing an increase of £510,017.

THE PROPOSED ELECTRIC LIGHTING EXPERIMENT IN THE CITY OF LONDON.

Last Tuesday, a Special Meeting of the Commissioners of Sewers of the City of London was held for the purpose of considering the report of the Streets Committee on the subject of electric lighting, submitting draft conditions with a view to advertising for tenders.

Mr. Bridgman, in moving the adoption of the report, said the matter of lighting the City by electricity was of great importance to the citizens, and one which would have an important bearing on the question of lighting by electricity generally. Several references and communications had been made on the subject to the Streets Committee. The first step they took was to refer the matter to the Engineer (Mr. W. Haywood) and the Solicitor (Mr. E. A. Baylis) with instructions to confer with Mr. W. H. Preece on the provisions of the Electric Lighting Act, 1888, and then to prepare and submit to the Committee the conditions on which the proposals for lighting the City by electricity could be entertained. On receiving this report, the Committee proceeded to consider four primary recommendations. The first was that it should be obligatory on the companies with whom contracts might be entered into to lay all wires and conductors beneath the public way; for they thought the time had come when they should discountenance any more wires being placed overhead. The second recommendation was that the City should be divided into three districts, in accordance with the plan prepared by the Engineer and Mr. Preece, and that alternative tenders be invited for lighting such districts and the City as a whole. The third was that the main streets should be primarily lighted, and be enumerated in the specification; and that the companies proposing to contract should be required to state the period at which the lighting of such thoroughfares would commence, and when it would be extended to the remaining streets. The fourth was that it should be a condition of any contract that when the profits had reached a cumulative dividend of 10 per cent., the surplus should be divided equally between the contracting company and the consumers. These conditions were referred back to the officers to be embodied in a general specification of conditions. These were again carefully considered *seriatim*, and altered as required, and subsequently approved by the Committee, and then presented to the Commissioners. The report had been circulated amongst the members, and the Committee now asked the Court to approve of their recommendation, and refer the matter back for them to obtain tenders. They intended to light the whole of the City by electricity; but, of course, the Commissioners would reserve to themselves the right of accepting or rejecting any tenders submitted. The City would be divided into three districts—western, central, and eastern. The first line of division would go down Aldersgate Street, St. Martin's-le-Grand, St. Paul's Churchyard (north side), Creed Lane, and St. Andrew's Hill, and thence along Queen Victoria Street to Blackfriars Bridge. It would be bounded on the south by the Victoria Embankment, and on the west by the City boundary. The central district would comprise the area bounded on the north by the City boundary, on the east by Finsbury Pavement, Moorgate Street, and Princes Street, thence across Mansion House Street, and along Walbrook and Dowgate Hill; on the south by the River Thames, and on the west by part of Upper Thames Street, St. Andrews Hill, Creed Lane, St. Paul's Churchyard (north side), St. Martin's-le-Grand, and Aldersgate Street. The east district was bounded on the north and east sides by the City boundary, on the south side by the River Thames, and on the west side by Dowgate Hill, Walbrook, Princes Street, Moorgate Street, and Finsbury Pavement. With regard to the tenders, it was proposed that an Ordnance map should be submitted, upon which should be shown the whole of the lamps as they at present exist, and also the different positions suggested for the arc and incandescent lamps. A description of the lamps to be used would be given, and also a diagram showing the intensity of the light. The standard of reference would be the illumination of a square foot of surface by a standard candle at 12·7 inches distance. As soon as the main thoroughfares had been lighted by electricity, the contractor would have to proceed to light the remainder of the public ways when called upon to do so. The present arrangement of gas-lamps would continue precisely as it was, in case of a breakdown of the electric system, in which event gas would be immediately available. Any excess of electricity would be paid for *pro ratâ*, according to contract. The work would, of course, be done entirely under the supervision of the Engineer. Subways would be made where they were suitable for the purpose; and where they did not exist, the whole of the lines would be laid beneath the footways. A fine of £1000 would be imposed in the event of the contract not being fulfilled in the case of each of the three districts. It was proposed to grant the contractors the exclusive right of lighting the City for private purposes, as far as it could be given. The words of the report were: "So far as the Commissioners are able to do so, they will grant to the contractor the exclusive right of supplying electricity for private purposes within the district during the term of the contract. The contractor will be required to supply electricity to any owner or occupier of any premises within a distance of 25 yards of the mains, provided the owner or occupier enters into a fair agreement to defray or divide the cost of the service-main, and to pay for the supply of the electricity. The contractor will have to state how he proposes to charge the consumer for the amount of electricity supplied, whether by meter or by agreement. If by meter, the charge will be either by the actual quantity of energy supplied as measured in units, each unit being equivalent to 1000 watts per hour; or by the mean average current expressed in ampères per hour multiplied by the number of hours of supply. If by agreement, the charge will be at the rate of so much per annum per standard lamp of 50 watts." The contractors would have the right of continuing private lighting though the public lighting might be discontinued, provided they had fulfilled their contract. A fine of £20 a day would be enforced for any defect of any of the mains or conductors of electricity, and a further fine of 40s. would be enforced for every delay of five minutes in lighting any particular lamp. All responsibility for this would rest with the contractors. If the profits arising from the investment exceeded a cumulative dividend of 10 per cent. per annum upon the capital invested, the excess was to be equally divided between the contractor and the consumer. The duration of the contract would be for 21 years; but the Commission would have the power to continue it for periods of seven years. They would also have power to determine a contract after three attempts to make good a failure. Power would be reserved to the Commissioners to acquire the undertaking by purchase at the end of 21 years. Mr. Bridgman then pointed out the difference between these conditions and those of last year. On the previous occasion, there was no control as to the regulation of dividends and profits, and there was no provision for acquiring the interests of the companies. The contract was then for seven years only. They were much more likely to get tenders for 21 years, considering the large amount to be expended. The present conditions were as favourable as they could be to the Commission, while they had also thought of the contractors. Mr. Harris seemed to have a strong preference for lighting by gas. ("No.") But since the last attempt at electric lighting, they had gained a considerable amount of experience; and Mr. Preece had told the Committee that the time had arrived when the City might confidently adopt the new system. Certainly an improvement was much needed in the mode of lighting the City streets, which at the present time was not worthy of the centre of this great empire.

Mr. C. T. Harris moved an amendment—"That the report be received and its consideration adjourned pending the applications to the Board of Trade for Provisional Orders authorizing the London Electric Supply Corporation, Limited, and the Metropolitan Electric Supply Company, Limited, to supply electricity within the whole of the City of London." He said if there was one thing more than another about which the Commission should exercise the utmost caution, it was electric lighting. During the last few years costly experiments had been made which had invariably been attended by disaster and failure. It seemed to him that in the past the Commission had been made the "catspaw" of certain speculative companies, who had paid 100 per cent. dividend. The present report was utterly different from the last; and if this one was feasible, the other must have been very bad indeed. He opposed the report last year because it gave a monopoly of private lighting, without any stipulations as to the price to be charged or as to profits. He objected to contracting with any companies outside the Act of Parliament. They would give the Companies the advantage of statutory rights, but relieve them from statutory obligations. They proposed to grant a monopoly of private lighting for 21 years; and he did not hesitate to say they had no legal power to do any such thing. All they could do was to promise to oppose any other company that might wish to come into the City. They had at the present time substantial companies applying to Parliament for statutory powers; and their applications would be decided during the present session. He was surprised to see in the *City Press* of the previous Saturday, a report of Mr. Preece to the Streets Committee. Two-thirds of the Commission were not aware of its existence, and would never have known of it but by reading it in the *City Press*. He found that it was the substance of a communication to the Streets Committee, every page of which was marked in red ink, "private and confidential, for the use of members only." He thought the Commission should be better informed as to how these things got about; for it was intended to prejudice the question. Mr. Preece suggested for the careful consideration of the Committee the undesirability of throwing this work open to public tender; and this was just what the Commission proposed to do, for they had already determined to oppose the Companies' applications, for the purpose of obtaining *locus standi*. Let the Court in the meantime use this as a kind of lever. If they proceeded at once, they would be led into costly litigation. He wanted the electric light brought to the doors of everyone at the lowest possible price, and they could only do this under cover of such Companies as were now applying for statutory powers. The Engineer would tell them that the arc light was not suited to the lighting of the City. They did not want large lights at great distances apart, but lights of less intensity at frequent intervals.

Mr. S. Harris seconded the amendment.

Mr. J. C. Bell deprecated as much as Mr. Harris the fact that documents should appear in public prints before they came to the Commission. He thought there was more in the amendment than appeared on the face of it. Mr. Harris seemed to speak as the advocate of the Gas Companies. All Mr. Preece had said was that, in his opinion, there were only three Companies financially capable of carrying out the work. This was not the time to discuss the details of the contract, and the *pros* and *cons* of electric lighting. They were not bound to accept any of the tenders, and could, if they pleased, revert to the old condition of things.

Mr. S. Price did not see why the Committee's report should not be adopted; but he cautioned the Commission against giving a fancy price for the article. The electric light might be the light of the future, but it was not the light of the present. The only people who had made anything out of electric lighting up to the present time were promoters of companies, who had obtained millions out of the British public.

Mr. Pannell said he and others were last year regarded as obstructives but those who had listened to the contrast between the old and new reports would see that they were now in a much better position for dealing with electric lighting. He himself moved the resolution out of which this report had arisen; and he thought, now that the matter was fairly before them, it would be quite competent for the Committee to go on with its opposition to the applications before Parliament.

Mr. Sly did not like the 21 years' proposal, as there might be a very considerable reduction in the price, and perhaps a much better quality of light, before this period had expired. His ward desired to have the electric light; and he did not think they ought to wait much longer, though by waiting they might have it a little cheaper.

Mr. Bedford said they had been adjourning this question for above five years, and now Mr. Harris wanted it adjourned again. They were becoming the laughingstock of the whole country with regard to this lighting question. At Eastbourne he had the most lovely light they could possibly conceive just opposite his door; and when he came home he found the old glimmer. Let them put faith in the eminent men they had consulted.

Mr. Bowring did not think it could be charged against the City that they had not moved with the times in this matter. Even at Eastbourne the Electric Lighting Company refused to go on at the same terms; and if it did not pay the Company in the long run, the consumer must suffer. The electric light had been tried in many parts of the City, and had been given up. Could they point to any considerable part of the Metropolis that was lit by the electric light?

Mr. Bedford: All the railway stations.

Mr. BOWRING said that in many cases it had been disused. No part of London was so well lighted as the City.

Mr. GREENWOOD said in all the towns he had seen lighted by electricity they had to supplement it with gas. At Eastbourne there was a gas-light between each of the electric lights. It was the same at Hastings and St. Leonards. At Barnet on two or three occasions the place had been left in darkness.

Mr. STAPLEY said the all-important question was the one of time. It was shown that they were in a better position now for having waited twelve months; and might they not be in a better position still if they waited until statutory powers were obtained, and worked under those powers? Otherwise they might be put to great legal expense.

After some further discussion, the amendment was put and negatived.

Mr. ASHBY moved a further amendment to omit the word "exclusive" in the following clause:—"So far as the Commissioners are able to do so, they will grant to the contractor the exclusive right of supplying electricity for private purposes within the district during the term of the contract." He said he strongly objected to giving any company an exclusive right.

Mr. TRELOAR seconded the amendment; but, after some discussion, it was rejected by a majority of one.

The motion was then agreed to.

PROVINCIAL GAS AND WATER COMPANIES.

Continuing the plan adopted in preceding issues of the JOURNAL, we give below the points of special interest in connection with the working of the undermentioned Companies for the periods stated:—

The accounts of the Cheltenham Gas Company for the past year have just been issued. They show that the capital was increased by the creation of £10,000 worth of 7 per cent. stock; so that the total at the end of the year was £140,000, which may be increased to £155,000. The loan capital (raised at 4½ and 5 per cent.) stood at £13,000. The expenditure during the year on capital account was about the same as in 1887—viz., nearly £8000. The receipts from the sale of gas during the last three years, excluding public lighting, have been as follows:—In 1886, 227,532,900 cubic feet, £30,549 5s. 9d.; in 1887, 236,934,400 cubic feet, £30,489 16s. 6d.; and in 1888, 246,157,500 cubic feet, £31,653 3s. 8d. The sales of residual products have increased from £6483 in 1886 to £7064 in 1887, and to £8069 in 1888. The principal items in the revenue account are as follows:—Receipts: Sale of gas, £31,653; public lighting, £4563; rental of meters and stoves, £898; residuals, £8069; miscellaneous, £51—total, £45,214. Expenditure: Gas manufacture, £27,023; distribution, £1890; management, £2221; public lamps, £1458; rates and taxes, £1047; miscellaneous, £277—total, £33,916. The amount of profit made last year, therefore, was £11,298. The profits in the previous two years were: 1887, £8220; 1886, £9430. The sum of £2000 is taken from the reserve fund account, which is left at £13,094; and after paying interest on mortgages and the usual half-year's dividends in June last, there remains a net profit of £9975 from which to pay the dividends now due, amounting to about £5500. The reduction made lately in the price of gas is, on last year's consumption, equivalent to a loss of about £2000 per annum; so that the Directors have fairly treated the consumers in disposing of the excess profit in their hands.

The Directors of the Derby Gas Company reported, at the half-yearly meeting of the Company last Wednesday, a profit (including bank interest) of £21,597 on the working for the past twelve months. Deducting the interim dividend and the interest on mortgages, there was left a balance of £12,236 available for division, out of which the Directors recommended the payment of the usual dividends at the rate of 10 and 7 per cent. per annum. The Resident Engineer and Manager (Mr. C. Taylor) certified that the whole of the distributing plant, with the exception of the purifiers and holders now in course of replacement, had been maintained in good condition during the year. The Chairman (Mr. G. Gascoyne, J.P.), in moving the adoption of the report, remarked that the Company had been in existence for 70 years; and the Directors had again to present a satisfactory statement in the face of very deplorable depression in trade. In 1886 the manufacture of gas amounted to 349 million cubic feet; in 1887, to 355 millions; and in 1888, to 361 millions. The gross receipts for the past year were £55,663 5s.; and the gross expenditure was £34,767. The net profits, including the balance brought over from the June half year, was £20,895 15s. The dividends and the interest on the bonds paid or payable amounted to £18,387; and after satisfying every claim, they had a balance of £1617 12s. 10d., derived from ordinary profits, and supplemented by the sum of £1721 from the improved value of residuals. This made a surplus on the whole year; of £3559 2s. 6d. The reserve fund amounted to £16,059, which was a welcome friend for a rainy day. The Directors were consequently not terrified by the result; and they proposed to recommend the payment of the usual dividends at the rate of 10 and 7 per cent. With regard to the electric light, after its failure at Barnet and Leamington, he thought they need be in no fear that it would damage their interests. The report was adopted, the dividends were declared, and the meeting closed with a vote of thanks to the permanent officials of the Company.

The shareholders of the Gloucester Gas Company held their half-yearly general meeting last Tuesday, when the Directors reported that the net profits for the six months ending Dec. 31 last amounted to £3724; and they recommended that the statutory dividends on the various classes of shares should be declared. This would absorb £3335, and leave a balance of £389 to be carried forward. As already intimated, the Directors decided, in view of the satisfactory results of the half-year's working, to recommend a reduction of 1d. per 1000 cubic feet in the price of gas as from the commencement of the current quarter; making a reduction of 3d. per 1000 feet in six months, or a saving to the consumers of about £1800 per annum. The price to the general consumers is now 2s. 6d., less 5 per cent. for prompt payment, or 2s. 4½d. per 1000 cubic feet. To the Corporation, and those consumers whose annual consumption exceeds 1½ million cubic feet, the price is, taking into consideration the discount for prompt payment, about 2s. 1½d. per 1000 cubic feet. The report was adopted.

The Directors of the Hartlepool Gas and Water Company have paid an interim dividend for the past half year at the rate of 6½ per cent. per annum, which is an advance on the amount paid last year.

The half-yearly meeting of the Leominster Gas Company was held on the 22nd ult., when the Directors reported a profit of £706 on the past year's working, and a balance of £576 on the profit and loss account. The usual dividends of 10 and 7 per cent. were declared; and there was left a sum of £238 to be carried forward.

At the recent annual general meeting of the Rastrick Gas Company, the Chairman (Mr. G. H. Crowther), in moving the adoption of the report and accounts, reviewed the work of the past year, which, he said, had been one of the most eventful years in the history of the Company. In resisting an application to Quarter Sessions, made by two gas ratepayers under section 35 of the Gas-Works Clauses Act, 1847, an absolute waste of £471 13s. 7d. had been incurred in law charges, which otherwise might have been applied to a further reduction in the price of gas. The capital expenditure during the year had been considerable; the works having become too small to produce the gas required. The increase during the last twelve months was 4½ million cubic feet; and since December, 1881, the sale of gas had risen from 20,000,000 to 32,000,000 cubic feet per annum—a very satisfactory feature, and one which at once explained the necessity for enlarging the works. For the past year the price of gas, subject to discount, had been 2s. 11d. per 1000 feet for the outer districts, and 2s. 6d. for the district within 300 yards of the hamlet of Brighouse, as within the latter area the Brighouse Local Board had a permissive power to supply. It was very desirable that a uniform price throughout the whole of the Company's district should be established; and the Directors were not without hope that ere long such might be practicable.

The annual general meeting of the Rhymney Gas Company, Limited, was held on the 21st ult., when the statement of accounts for the year ending Dec. 31 last were presented, and a dividend at the maximum rate was declared, notwithstanding the reduction of 3d. per 1000 cubic feet made on Jan. 1, 1888, and a large expenditure having been made during the year for renewals and repairs. The Directors stated that for this they had to thank their Manager and Secretary (Mr. T. Acland) for his untiring energy on their behalf. The increase in the sale of gas for the year was 10·55 per cent. The average make of gas per ton of coals carbonized for the year was 10,614·6 cubic feet. The leakage account has been brought down 5·89 per cent. below what it stood at at the same period of the preceding year.

The report presented by the Directors of the Rugby Gas Company at the annual general meeting last Thursday stated that the receipts on revenue account in the year ending Dec. 31 last amounted to £10,089, and the expenditure to £6610; leaving a balance of £3479 to be carried to the profit and loss account. The amount available for division was £3964; and the Directors recommended a dividend at the rate of 11 per cent. per annum; making, with the interim dividend at the same rate, a total of 11 per cent. for the year.

The shareholders of the Salisbury Gas Company held their half-yearly meeting on the 20th ult., when the undertaking was reported to be in a satisfactory condition. It was resolved to declare dividends for the six months ending Dec. 31 last at the rates of 10, 8, 7, and 6 per cent. on the various classes of shares.

At the half-yearly general meeting of the Sevenoaks Water Company, held on the 23rd ult., the Directors reported an amount of £1025 16s. 10d. available for division. They therefore recommended a dividend at the rate of 8 per cent. per annum on the consolidated stock, and of £5 12s. per cent. per annum on the share capital, free of income-tax. This will absorb £950 16s.; leaving a balance of £75 to be carried forward. The report was adopted.

At the recent annual meeting of the Weston-super-Mare Gas Company, the Engineer and Manager (Mr. J. H. Gray) reported that the increased gas consumption in the past year was 5 million cubic feet. The gas made averaged 9970 cubic feet per ton of coal carbonized; and the unaccounted-for gas was 3·7 per cent. The tar and liquor made was about the general average; but the sulphate sold was an increased quantity of 21 tons as compared with the preceding year. There was a gain of customers; and a decided increase in the use of gas-fires. The Directors reported that the Company's financial position was very satisfactory, notwithstanding that since June last the price had been reduced from 3s. 9d. to 3s. 6d. per 1000 cubic feet. The statutory dividends on the respective shares were recommended. The reports were adopted; and a proposal to increase the salary of the Secretary (Mr. H. F. Davies) to £90 per annum was approved.

The report of the West Surrey Water Company for the half year ended Dec. 31 last, which was adopted at the meeting of shareholders held last Tuesday, stated that the income for this period, after making provision for empty houses, irrecoverable rates, &c., amounted to £2217, and the expenditure to £890. Comparing the accounts with the corresponding half of 1887, the income exhibits an increase of £114, and the expenditure a decrease of £41. Including the balance brought forward from last year, less the dividends, &c., paid in August last, and after deducting the interest on the mortgage loans (£297), there was a balance of £1152, which the Directors recommended should be applied as follows:—First, to the payment of dividends upon each class of preference shares, amounting to £536; secondly, to the payment of a dividend at the rate of 3 per cent. per annum on the ordinary shares. This would leave a balance of £158. Reference was made in the report to the fact that a scheme was promoted at the close of last year, by the Chertsey Rural Sanitary Authority, to establish pumping works and a sewage farm for the drainage of Weybridge, &c., within a short distance of the Company's works and intake from the River Thames; and as this would have been most prejudicial to their interest, it was opposed by them, as well as by some of the Metropolitan Water Companies. An inquiry was held by direction of the Local Government Board, and eventually they refused their sanction to the scheme, as being detrimental to the purity of the river. The report was adopted. The Company are about to raise £4000 of additional capital by tender.

The Winchester Water and Gas Company had their half-yearly meeting on Monday last week, when the Directors reported receipts on revenue account to the amount of £3869, and an expenditure of £5210; leaving a sum carried to the profit and loss account of £3659, and making the balance of this account £5347. A dividend for the six months at the rate of 10 per cent. per annum on the ordinary stock, and one at the rate of 7 per cent. per annum for the half quarter ending Dec. 31 last on half the new capital, were declared.

The annual general meeting of the Wolverhampton Gas Company was held last Tuesday—Mr. J. Underhill in the chair. The report of the Directors for the six months ended Dec. 31, 1888, showed the total receipts during that period to have been £28,819; and the expenditure, £20,410—leaving a net profit of £8409. This sum, added to the balance from the last account, made the total £8717. From this the Directors recommended the payment of a dividend of 5 per cent. upon the consolidated stock, and 3 per cent. (less income-tax) upon the preference shares. The dividends recommended would absorb £6395; leaving a balance of £2332. From this balance the Directors proposed to transfer £1000 to the reserve fund, and to carry £1322 to the next account. They announced a reduction in the price of gas of 2d. per 1000 cubic feet from the last quarterly reading of the meters. The works were reported to be in good working order; but, to meet an increasing consumption, it was stated that it would be necessary to make further additions. The Chairman, in moving the adoption of this report, remarked that the proposed reduction would absorb something like £3000. They had restored the reserve fund to £3327, and left a balance of rather more than £600, which could be transferred at their option. The Directors had been applied to on the subject of instituting differential charges for gas; but they were disinclined to make any distinction. The report was adopted; and a resolution authorizing the payment of dividends of 5 and 3 per cent. for the half year upon the consolidated stock and the preference shares respectively was passed. In responding to a vote of thanks, the Chairman said there was no doubt that the Company would get over all difficulties with the Corporation as to the electric light. If the Corporation chose to give them

the power to supply the town with that light, he thought they could compete favourably with anybody. The Engineer and Manager (Mr. J. Annan) and the other officials were also thanked for their services.

The half-yearly general meeting of the Eastbourne Gas Company was held on Monday last week—Dr. Jeffery in the chair. The accounts for the six months ending Dec. 31 last showed a balance of £7565 available for division; and the Directors recommended dividends at the rates of 12½ and 9¾ per cent. per annum. These would absorb £4633, and leave £2932 to be carried forward. In moving the adoption of the report, the Chairman congratulated the shareholders on the continued prosperity of the Company, as evidenced by the accounts, which, notwithstanding the electric light, showed increased business. In the course of his speech he made some amusing references to the electric lighting at Eastbourne, Hastings, Leamington, and Barnet; and concluded by remarking that he thought it would be a long time before the Chairman of the electric light company which supplies Eastbourne would be able to propose dividends similar to those they were then about to declare. Votes of thanks to the Chairman and Directors, and also to the Manager and Consulting Engineer, were passed; and Mr. J. Hammond, in acknowledging the reference to himself as Manager, said it was his desire to do all he could to enable the Directors to reduce the price of gas.

The half-yearly meeting of the Portsea Island Gas Company was held on the 23rd ult., under the presidency of Mr. T. S. Edgcombe. The accounts presented showed that in the six months ending Dec. 31 last, the revenue had been £47,388, and the expenditure £31,637; leaving the sum of £15,746 to be carried to the profit and loss account. In their report the Directors recommended the payment of dividends at the rate of 12½ per cent. per annum on the "A" and "B" shares, 11½ per cent. per annum on the "C" shares, and 5 per cent. per annum on the stock; also that the usual donation of £50 should be presented to the funds of the Royal Portsmouth, Portsea, and Gosport Hospital. The report was moved for adoption by the Chairman, who remarked upon the continued prosperity of the Company; the provision which had been made, by the purchase of land at Stamshaw, for the erection of entirely new works, should the continued increase of consumption necessitate such a step; and the probable early reduction in the price of gas from 2s. 6d. to 2s. 5d. per 1000 cubic feet. The report was adopted.

The annual meeting of the Bishop Auckland Gas Company was held last Friday—Dr. Jobson, J.P., in the chair. The statement of accounts for the past year showed the receipts on revenue account to have been £5705, and the expenditure £2702; leaving a profit of £3003. Dividends, as recommended by the Directors, were declared, which, with the interim dividends paid for June, 1888, made a total for the year of 9 per cent. on old shares and 6 per cent. on new shares; leaving a balance of £192 to be carried to the next account.

In the report of the Directors of the Dover Gas Company, which was presented to the shareholders at their half-yearly general meeting yesterday, they stated that the accounts for the half year ending Dec. 31 last were of the usual satisfactory character, although the customary increase in the consumption of gas did not occur. This they believed to have arisen mainly from the excessive brightness of the weather during the autumn, as compared with the severity of the close of 1887; and therefore they considered that it did not indicate any falling off in the progressive condition of the Company's business. The profit for the half year was £2504; and the amount required for the usual dividend was £2614. The surplus profits which were brought forward in 1887 were available to make up the difference, £110; and the Directors recommended the declaration of the full dividend, at the rate of 7½ per cent. per annum.

The half-yearly meeting of the Chichester Water Company was held on Friday, the 22nd ult., when the Directors' report, which was submitted by the Chairman (Mr. Alderman Smith), showed that the prosperity of the undertaking, which is under the care of Mr. A. Barton, has been maintained. The water-rentals during the last three half years have been as follows:—For the half year ending December, 1887, £1187 10s.; June, 1888, £1184 5s.; December, 1888, £1188 11s. The profits for the past six months amounted to £709 6s., which, together with the sum of £880 6s., the balance of profits brought forward from the previous half year, amounted to £1589 12s., out of which an interim dividend of 8s. 9d. per share on the fully paid-up shares and of £7 per share on the partly paid-up shares (£8 paid), free of income-tax, was declared on Aug. 23, 1888, amounting to £829 8s. This had been paid; and a balance of £760 9s. 4d. remained applicable for distribution. The Directors recommended that a dividend of 7s. 11d. per share on the fully paid-up shares and of 6s. 4d. per share on the partly paid-up shares (£8 paid), free of income-tax, making upwards of 8½ per cent. for the year, should be declared. The report was adopted, and the dividends recommended were declared.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Saturday week, at the Offices, Willoughby Lane, Tottenham—Mr. G. Gripper in the chair.

The Secretary (Mr. J. Randall) read the notice calling the meeting; and it was decided to take as read the Directors' report and the statement of accounts for the half year ending Dec. 31 last, allusion to which was made in the Journal for the 19th ult. (p. 352).

The Chairman proposed—"That the report of the Directors, with the statement of accounts for the half year ended Dec. 31, 1888, be received and adopted, and that the report be entered on the minutes of the proceedings of this day." He remarked that, under the circumstances of a reduction in the price of gas which was made at the last meeting, and which followed so quickly upon a previous reduction, he thought they might congratulate themselves upon the satisfactory condition they were in. It would be seen that, although the price was reduced 2d. per 1000 cubic feet on July 1—which was equal to giving the consumers £1100, and enabled the shareholders to distribute among themselves £900—they had so far recovered their position that it was only necessary to trench upon the undivided profits to the extent of about £280. The Directors had every reason to believe that the opinion they expressed last year would be found correct—that within twelve months the reduction of 2d. would be entirely recouped; and, he thought, rather more so. In this they were assisted a good deal by the increased price of residuals. At the last two or three meetings, he had had to report that the price of their bye-products was very low; but they were now realizing better rates, though not quite the original ones. The improvement under this heading was nearly £800. There were really no other observations that occurred to him in the fortunate position in which they were placed. They were prosperous; and when in that condition—when the Board gave a statement of figures that showed this, it was the best thing they could do or say.

The Deputy-Chairman (Mr. J. Malcolm) seconded the motion.

Mr. W. Low observed that he thought the item of £155 2s. 3d. in the accounts for law charges was large for six months. He did not understand there were any law cases going on.

The Chairman said that the Company were threatened by the Outer Circle Railway coming through their works; and it became necessary for them to appear in opposition to the Railway Company's Bill. The Board made arrangements which would have been satisfactory to both parties, to protect the Company's rights; but for some reason or other, the railway had not been proceeded with. This referred to £140 of the amount in question; the other £15 was expended in a similar way—in defending their position. A Tramway Company sought to interfere with the gas-mains; and it was necessary to protect the Company, and keep the mains from being injured. The Directors had placed the £140 to revenue; but they reserved to themselves the right, if the railway went on, of charging it to capital.

The motion was then unanimously carried.

Mr. J. Warren moved that a dividend for the past half year at the rate of 11½ per cent. per annum on the original capital, and of 8½ per cent. on the new ordinary capital, both less income-tax, be now declared, payable on March 2 next.

Mr. Corbet Woodall said that he had great pleasure in seconding the motion, inasmuch as they had fairly earned this dividend in the half year. He could share the Chairman's congratulations to the shareholders on the fact that the whole of the reduction had practically been paid back; and he and his colleagues looked confidently forward to a very early further reduction in the price of gas.

The motion was agreed to.

Mr. Low moved a resolution, thanking the Directors for the attention they gave to the Company's affairs. He remarked that it must be very gratifying to the shareholders to find their property increasing year by year, and to the consumers to receive substantial benefit in the way of reductions in price through the care and attention the Directors bestowed on the business. He had no doubt that what Mr. Woodall had suggested would be forthcoming at the next meeting—that was, a further reduction in price; though he did not think the consumers could complain of the present charge. He then went on to refer to the probable abolition of the coal dues; and said he expected to have seen some allusion made to the subject in the report. It was very pleasing to them as shareholders to receive an extra ½ per cent. dividend.

Mr. A. G. Hounsham seconded the motion; remarking that he could speak in a double capacity—as a consumer and as a shareholder. He was sure the consumers were thankful for these successive reductions in price. It seemed to him that the sliding scale was a blessed arrangement—it blessed both the gas maker and the gas taker. At any rate it was a capital thing that when they gave the consumers £1100, the shareholders obtained the benefit of £300. Regarding the future, they had nothing to fear; as they reduced the price, they would be able to meet the competition of oil or the electric light.

The motion was heartily agreed to.

The Chairman, in acknowledging the vote, said the policy of the Directors was to promote the welfare of the Company by lowering the price of their gas as often as possible. When they obtained their Act, the price was 3s. 8d. per 1000 cubic feet; it was now down to 3s. 2d.; and they hoped it would soon be at 3s. Mr. Low had referred to the coal dues. The Directors had had this matter under consideration; but, of course, they did not like to prophesy until they knew what the effect of the abolition of the dues would be. If the Board found the cost of coal was reduced in an adequate proportion to the reduction of the dues, it would enable them the more readily to lower the charge for gas another 2d. As Mr. Woodall had let the shareholders into one of the secrets of the Board in regard to a probable reduction in the price of gas, he (the Chairman) might mention another one. They had for some time had under consideration the position of the share capital; and they had unanimously come to the conclusion that it would be to the advantage of the Company to convert the shares into stock. It would save an immense amount of work, and be of great security to the shareholders. The Board wanted to take this step, as in time they would have to get some new capital for extensions. He was not proposing this in any official way; but was simply giving the shareholders a little bit of the Board's opinion. Proper notice would be given that the matter would be brought forward at the August meeting of the Company, to obtain the sanction or otherwise of the shareholders.

On the motion of Mr. Alfred Richards, seconded by Mr. J. Gould, a vote of thanks was passed to the Auditors (Messrs. Nicol and Baynes).

Mr. W. H. Lang proposed, and Mr. J. L. Chapman seconded, a vote of thanks to the Secretary (Mr. J. Randall), the Engineer (Mr. W. H. H. Broadberry), and the staff; and it was unanimously concurred in.

The motion was acknowledged, and the proceedings terminated.

DINSMORE GAS COMPANY, LIMITED.

The Second Annual Meeting of this Company was held in Liverpoo on Monday, the 18th ult.—Mr. Malcolm Guthrie in the chair.

The Secretary (Mr. R. C. Johnson) having read the notice convening the meeting, the report of the Directors and the statement of accounts for the year 1888 were taken as read.

The Chairman, in moving the adoption of the report, said the first task the Directors had to undertake was to prove the soundness of the Dinsmore process of gas making upon a sufficient scale to enable them to present themselves to gas engineers and ask them to take it up on a working scale. After spending some months in testing the process, they felt they could confidently do this; and the Hoylake Gas Company were the first to come to terms with them. An arrangement was made with that Company for plant to be put up (free of cost to them) in their works, to be under the charge of the present Directors and of Mr. Dinsmore himself. Nearly the whole of last summer was occupied in surmounting various unforeseen difficulties. But there was still a period of two months, before the winter season set in, in which to work the process; and the result was highly satisfactory. The quantity of gas made was increased, and the quality was found to be good. It was also ascertained that the gas was of a good travelling capacity, and maintained its high illuminating properties to the extent of the supply of that comparatively small district. However, when the winter demand came on, the plant was insufficient to supply so large a quantity of gas, and the Directors had temporarily to abandon the experiment. In the meantime they applied to Mr. T. Newbigging, C.E., of Manchester, to examine the process and furnish a design for a new plant to be prepared during the winter months, ready for resuming operations at Hoylake when the spring arrived. This had been done. Mr. Newbigging thought very highly of the experiment, and supplied the new designs. The plant was in process of erection, and would shortly be complete, and, with longer evenings, the Directors would soon be in a position to resume work at Hoylake. The other body which took up the process, under the recommendation and superintendence of Mr. Isaac Carr, was the Widnes Local Board. The whole of last summer was occupied by that gentleman in perfecting the process of gas manufacture; and the Directors were much indebted to him for the hard work and the intelligence which he had brought to bear upon it, and for the position in which they were now placed. The results at Widnes had been published from time to time; but it might be well to give the results of the process up to the 4th of February, which was the last date he had before him. [The Chairman then read an

extract from Mr. Carr's report to the Widnes Local Board, which appeared in the JOURNAL for the 19th ult., p. 352.] This was the history of the work at Hoylake and Widnes, and the position at the present time. The shareholders would ask what further business the Directors had in view. Well, upon the Widnes results, the town of Warrington had been induced to try the process. The arrangement was for a three months' trial, after the plant was fully erected; and if they were satisfied with the results, and they corroborated those which had been obtained at Widnes, they would be willing to adopt the process, and terms had been fixed at which they would have the option of taking it up. That was the only definite agreement made; and it was only a tentative one. But they had lately had a number of visits from gas directors and engineers from various parts of the country, who appeared so well pleased with what they had seen that the Directors thought agreements of a similar description would be arrived at with regard to some of them. The object of the Board during the present summer was to find at least half-a-dozen works which would take up the process; and if they could do this, they would be very hopeful about the future of the Company. They were now pushing the process. Gas engineers and gas directors, when they first heard of it, were naturally very sceptical about the results obtained by the Company; but when they began to look into it they thought there must be something in it. The success as a manufacturing operation was established; the only question now was as to its commercial value.

Mr. WIMPFHEIMER seconded the motion, and it was carried *nem. con.*

The retiring Director (Mr. Wimpfheimer) was then re-elected; and Mr. E. W. Crosbie Oates was appointed Auditor for the ensuing year.

Mr. J. J. GRYLLS next proposed, and Mr. ST. CLARE BYRNE seconded, a vote of thanks to Mr. Isaac Carr, for his indefatigable efforts on behalf of the Company.

The proposition having been carried,

Mr. CARR returned thanks for the compliment. He assured the shareholders that there had been no over-statement as to what the Company could do; and the only reason for the results at Widnes not being better than they were was because the apparatus in its present form was not equal to doing more work. With that which was now being erected, however, they would be able to get much better results. In face of the existing keen competition between gas, oil, and electricity, he thought the invention would prove of great advantage to gas companies, as it would enable them to keep their competitors at a distance, and to supply their consumers with a better light at a lower price than hitherto. This was a definite stride for the gas companies to make, and one for which they ought to be truly thankful. Of course, gas managers, as a rule, did not jump very readily at new things; but of the great future of the Dinsmore process there could be no question whatever with anybody who had taken the trouble to investigate and understand it.

A vote of thanks having been accorded to Mr. Dinsmore,

A SHAREHOLDER asked Mr. Carr whether the gas produced by the Dinsmore system was purer than ordinary coal gas, owing to the double distillation.

Mr. CARR replied that it was, in consequence of the diminution of the sulphur compounds other than sulphuretted hydrogen. But there were also other deleterious compounds; and these, owing to the double distillation of the Dinsmore gas, were very greatly reduced. This, therefore, would be another feature in favour of the process.

Further information as to the cost of coal under the two processes, the respective qualities of the gas, and the value of the residuals, having been asked for,

Mr. CARR stated that, in addition to the figures already given, which showed what was being done with the process, the cost of labour was the same as with the ordinary system—in other words, there was no increase of labour to produce the improved results recorded. The residuals were quite as good as by the old process, except that they were *minus* the tar; and there was also a slight difference in the fuel. The gas had to be heated up a second time, and some fuel was required to do this, and to burn off the tar; but the difference was very small indeed—so small in fact, that it scarcely needed to be taken into consideration.

A vote of thanks was then passed to the Chairman for presiding, and the proceedings closed.

WOKING WATER AND GAS COMPANY.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, Nos. 5 & 6, Great Winchester Street—Mr. C. HORSLEY, J.P. (in the unavoidable absence of the Chairman, Lieut.-Col. Galt), presiding.

The SECRETARY (Mr. W. G. Gribbon) having read the notice convening the meeting,

The CHAIRMAN proposed the adoption of the report and balance-sheet. Calling attention to the statement in the former that the total expenditure on capital account had been £59,519, he said that it would be seen by this that the capital was going up a little. The shareholders would understand that, in a water undertaking, they had to keep going farther afield as the district increased, and they had to find fresh supplies of water. He might say that there was plenty of water were they were situated if the owner of the estate would allow them to drive adits; and then they would not have to go anywhere else in search of water for some years to come. He would not, however, permit the Company to do this unless they paid him a large sum of money; and this was why they had to go to East Horsley for an additional supply. The revenue for the year had been £3360; and the expenditure, including depreciation, £1403. For a new Company, he regarded this as very good indeed. The balance carried to profit and loss account was £1956; and the balance available for dividend was £962—that was after having paid the half-yearly dividend. The Directors recommended a dividend at the rate of 3½ per cent. per annum. The Engineers reported that the works were all in good order; and he might add that one of the pumping-stations was doing remarkably well. The water in the well, he believed, had risen something like 7 or 8 feet higher than it was last year. Owing to the wet season they had had, the meter-rentals fell short; and this made a good deal of difference to them. The increase in the water receipts, however, was rather more than £186. Some of the Rural Sanitary Authorities within the area of the Company's new Act had under discussion the introduction of the Company's water-mains in the districts between North Aldershot and Frimley and Camberley. The Directors would want a guarantee from that district of perhaps £1200 a year before they could extend their mains.

Mr. R. RANDALL seconded the adoption of the report.

Mr. R. HESKETH JONES, replying to a question as to when the £5400 of 5 per cent. bonds would fall due, said that, inasmuch as they would have to be paid off in cash, shares, or debentures from July next for about twelve months thereafter, the Directors would be pleased to receive from the holders applications to take them at 4 per cent. Assuming that they had applications from outsiders at 4 per cent., the Board could ask the present holders to renew them at that figure, or take cash for them.

The CHAIRMAN observed that the balance-sheet was not so good as he should have liked it to be. The Company's mains however, were laid over a large area; and they might expect a steady growth of income. Since the last Directors' meeting, they had received £23 rental from one district where the mains had only been down for three or four months. They made it a practice not to make extensions unless they saw a certain return of 10 per cent. from them. He went on to speak very hopefully of the prospects of the Company, and said he trusted that before long the shareholders would receive a better dividend.

The motion was then carried.

A resolution was next agreed to declaring a dividend for the past six months at the rate of 3½ per cent. per annum, payable on the 5th inst.

On the motion of Mr. R. H. JONES, seconded by Mr. T. H. HOVENDEN, the retiring Directors (Lieut.-Col. Galt and Mr. C. Horsley) were re-elected.

The Auditors (Messrs. W. Edmonds, F.C.A., and Mr. W. H. Hardie, F.C.A.) were also re-appointed.

A vote of thanks having been passed to the Chairman and Directors,

Mr. JONES, in acknowledging it on behalf of himself and colleagues, remarked that on these occasions they sometimes had questions put to them as to what was being done in regard to the supply of gas in the neighbourhood. He was not in a position that day to tell the shareholders very much; but he could say that the question had not been lost sight of by the Directors. At the present time there was a little negotiation going on between outsiders and the Board, with the object of erecting small gas-works for the supply of Woking. The capital for this purpose would be raised outside the capital of the Company; but they would have a limited interest therein. In the opinion of the Directors, it was better that there should be a local gas consumers' company, than that they, as a Water Company, should raise capital for the purpose of erecting gas-works. He merely mentioned this matter in order to show that the question had not been overlooked. He did not want to enter into any full particulars; and therefore he hoped the shareholders would not probe him with too many inquiries on the subject.

Mr. RANDALL hoped the Board did not mean that they were going to sell their right to supply gas.

The CHAIRMAN said they had been asked over and over again when they were going to supply gas. If the Woking Railway Station would take gas, they would commence business at once.

Mr. RANDALL thought if another Company could make it answer to supply gas, they could do the same.

The CHAIRMAN said their own Company would still be in power; and the other Company would have to pay for the right of supplying gas. The shareholders might rest assured that the Board would look after their interests; and perhaps, if the present proposal was carried out, they would get as much out of it as if they themselves supplied gas. Before the Directors did anything definite in the matter, they would, of course, consult the proprietors. The Board had canvassed the district two or three times to see what could be done; but they were not promised sufficient support to justify them in proceeding any further.

The ENGINEER (Mr. Quick), in answer to a question, said that the cost of the new well and adits amounted to between £1500 and £1600. There were about 700 feet of adits.

A vote of thanks to the officers concluded the business of the meeting.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel—Mr. W. T. WESTERN in the chair.

The notice calling the meeting having been read, it was agreed to take as read the report and accounts for the past year. The balance on revenue account was Rs. 124,370·10, equal nominally to £16,807 3s. 6d. From this had to be deducted for differences in exchange, £4845, and general charges of management £1068, including discount charges; leaving a net profit of £10,894.

The CHAIRMAN said that the shareholders would notice from the report that the Company was going ahead a little. The receipts for water exhibited an increase of 10 per cent. compared with the preceding year; and the quantity of water delivered to the consumers had augmented in like proportion. This showed that the moderate rates charged did develop the business. This was exceedingly satisfactory, inasmuch as there had been but little building going on, nor much increase in the town. The consumption per consumer, however, was undoubtedly growing. There was only one section of the town where building was being carried on, and that was the central part of the Company's district—what was known as Old Petersburg. There had been a comparatively large drop in the miscellaneous receipts. The explanation of this was that in the two previous years, they had some contracts with the Government for putting in fittings, meters, &c., out of which they made a very satisfactory profit. They have not had any work of this kind during the past year. There was another cause for the decrease under this heading. New customers were entitled to have the water laid up to their doors for a sum defined in the concession. This sum had never been varied for the last 15 years; and they were paid the same now as in the early period of the Company's existence, when materials were much cheaper at St. Petersburg. However, on the average, they had made a nice little profit on this work. The Manager reported that the price of materials had risen so much that for the past year—for the first time—there had been a deficit on this account. The concession provided that, in these circumstances, the Company could have the tariff for this particular work revised; but it had not yet arrived at a stage in which the Board thought fit to disturb the arrangement. Turning to the revenue account, it would be found that the expenses had grown. The expenditure for coal had increased, owing to the larger quantity of water they had to pump. The other unsatisfactory item was the distribution account, which was composed of the expenses of the general outdoor control. This item was affected adversely by frosts in the early part of the year; and, on this point, he was sorry to say that the Company had rather bad prospects for the current year. The Manager reported that there had been very little snow at St. Petersburg, which, strange as it might seem, was bad for the Company. A good coating of snow kept the earth warm; and they then had little trouble. If there was no snow, the frost got into the ground; and then about March their difficulties came. This meant heavy labour bills in putting the pipes right. The pipes did not break; but they had to thaw them. There were two or three items in which they had managed to save a little. In repairs and maintenance there had been an increase of expenses, which was partly accounted for by the fact that the Board had taken the opportunity of overhauling the original engines which they put up at the Vassili Ostroff station. Having now got a third engine at work there, they were able to carry out any necessary repairs. The next item in which there was any material alteration was that of exchange; and in this respect they stood in a far better position than they had done for some years past. Last year, at the time of their meeting, the rate of exchange was 19½d.; and it was now 25½d. Speaking of the future, he thought the prospects of the Company were very fair. Owing to the increase of consumption, he went on to remark, in the old part of the town, they were proposing to

erect a third engine of 80-horse power at the Petersburg station. The two present engines, which worked very well, were only of 40-horse power. The only drawback was finding the money for the purpose; and it was owing to the necessity of obtaining this money that they were unable to recommend any increase of dividend on the "B" shares. They hoped, however, to be able to supplement it handsomely at a not very distant date. The balance-sheet this year was sounder than last; and showed smaller liabilities and much larger assets. He concluded by moving the adoption of the report and accounts.

Mr. R. S. GUINNESS seconded the motion, which was carried *nem. con.*

The retiring Directors (Mr. A. F. H. Darley and Lord E. S. Churchill) were re-elected; and a vote of thanks to the Chairman and Directors concluded the proceedings.

COLNE VALLEY WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Cannon Street Hotel on Friday, the 22nd ult.—Mr. J. R. HOLLOND in the chair.

The SECRETARY (Mr. W. Verini) read the notice calling the meeting; and the report and accounts, a summary of which has been already given in the JOURNAL (*ante*, p. 354), were taken as read.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said there were one or two points in them which he wished to emphasize. The water-rates and meter-rents amounted in the six months to £5183, against £5094 for the corresponding period of 1887—being an increase of only £89. But this was not as unsatisfactory as it might appear when it was considered that, owing to the very cold and wet summer, there was less water used for road purposes and the swimming-baths than previously. Empty houses continued to increase; but at the same time they were somewhat counterbalanced by new supplies. As to empty houses, there was a total deducted in 1888 amounting to £571; the total deducted in 1887 was only £480—showing a loss of £91. On the other hand, there were 106 new supplies laid on during the past half year; representing a rental of £222. The rates payable for houses laid on in the first half of the year was £151—making the total for the year £373; and this had to be set against the loss of £91 on empty houses. As to new extensions, the principal one that had been made was to Escott. With the exception of one parish, they had now gone into all the districts that they had power to supply by their Act. The shareholders would see by the report that early in the year they wanted £1000 taken up in new shares; and they received applications for them amounting to £9400. There was one matter which had given them considerable difficulty, and that was the waste of water that had been occurring during the last few months of the year. They had taken some very careful proceedings to ascertain how this occurred; and had found waste amounting to 200,000 gallons a day. The Board had been considering that day the question of employing the Deacon waste-water meter, which had been adopted, with beneficial results, in almost all districts having constant supply.

Mr. C. E. KEYSER seconded the motion.

Mr. KERSHAW deprecated the adoption of the Deacon system, as, in his opinion, it was very expensive; and he thought a great deal could be done in the way of detecting waste by a systematic search.

The report was adopted.

On the motion of the CHAIRMAN, seconded by Mr. ETHERINGTON, a dividend was declared at the rate of 2½ per cent. per annum.

The retiring Directors (Messrs. H. H. Gibbs, C. T. Part, and A. G. Watson) and Auditor (Mr. G. Van de Linde) were re-elected.

The usual complimentary vote having been passed to the Chairman and Directors, the proceedings terminated.

SALFORD CORPORATION GAS SUPPLY.

THE PROPOSED DRAFT UPON THE DEPRECIATION FUND.

In the JOURNAL last week reference was made to a discussion which has been going on in the Gas Committee of the Salford Corporation relative to the transfer to the borough fund of £60,000, out of the £78,000 accumulated on gas-works depreciation account. As already mentioned, the matter has been specially considered by the Auditor of the Corporation accounts, whose last report contains the following paragraph in regard to the subject:—"The setting aside of a depreciation fund is made incumbent on your Council by the provisions of the Salford Improvement Act, 1862, and is therefore, like the sinking fund, obligatory. But while the payment to the sinking fund is fixed and certain, the payment to the depreciation fund is in a sense discretionary; that is, a maximum percentage being fixed by the Act, it is only needful to provide sufficient to secure the proper carrying out of the objects named in the Act, the words of which are simple and precise:—'In setting apart a sum not exceeding £3 per centum per annum upon the capital invested in relation to the gas-works for the purpose of forming a depreciation fund, to be from time to time applied and expended in making replacements and repairs necessary to maintain the gas-works in efficient condition.' And while it is certainly incumbent to provide a depreciation fund, it is, on the other hand, equally incumbent that no more shall be taken out of the profits for such purpose than is actually required. And it is quite evident there is no intention that large accumulations shall be made out of profits to provide for future extensions or the erection of new works. You have, however, at the present time, an accumulation on this account of nearly £78,000, which is increasing at the rate of £9000 per annum, after fully providing for the objects named in the Act. This large accumulation has arisen partly through an excessive percentage having been set aside in the past, and partly through the wrongful addition to the fund of the interest earned upon it, which ought rightly to have been credited to the general profit and loss account instead. The following figures will show how largely in excess of the legitimate needs of the fund is the amount set aside:—In the year ending March 31, 1888, the amount set aside for depreciation on works and plant at 3 per cent. was £14,575 4s.; the interest on the fund for the year was £1935 2s. 10d.—a total addition for the year of £16,510 6s. 10d. The average annual expenditure for the past ten years has been £7233 15s. 4d., or an amount in excess of £9376 11s. 6d. The actual expenditure for the year has been only £3771 2s. 3d. I do not wish to be understood as objecting to a reasonable surplus over estimated requirements being set aside, or to the retention of even the present large balance in hand, although it is a question whether the sum of the accumulated interest should not be restored to the general fund, and divided between the districts. At any rate, the interest should no longer be added to the depreciation fund; and I should recommend most strongly that for the future a reduction of at least 1 per cent. be made on the percentage set aside."

NEWCASTLE AND GATESHEAD WATER COMPANY.—At the annual meeting of this Company held last Tuesday—Alderman Plummer in the Chair—the Directors' report, an epitome of which was given in the JOURNAL for the 10th ult. (p. 349), was adopted, and the dividends recommended therein were declared. The Bill promoted by the Company to obtain power to raise further capital and construct additional works was considered and approved.

THE METROPOLITAN BOARD OF WORKS AND THE GAS AND WATER SUPPLY OF THE METROPOLIS.

In the JOURNAL last week we reproduced from the annual report of the Metropolitan Board of Works the general review contained therein of the Board's proceedings in connection with the gas supply of the Metropolis during the 33 years of their existence; and, in view of the subject being to a certain extent related, we closed the story by giving an account from the same source of their experiments in public lighting by electricity on the Thames Embankment. We now give the chapter dealing with the

WATER SUPPLY.

The Board's connection with this subject began in the year 1867, when a Royal Commission was appointed to inquire into the Water Supply of England, including London. The Commission (over which the Duke of Richmond presided, and of which Sir John Thwaites, then Chairman of the Board, was appointed a member by the Government of the day) obtained a large amount of evidence and information bearing upon the subject; and in June, 1869, made a valuable and comprehensive report. The Commissioners considered, among other questions, that of a constant supply of water; and they expressed the opinion that the constant service system ought to be promptly introduced to the furthest extent possible in the Metropolis. They thought, however, that the system could not be effectively applied to London so long as the water supply remained in the hands of Companies, as it would be inexpedient to confide to them the great powers necessary for the purpose. They therefore advised that the future control of the water supply should be entrusted to a responsible public authority. The views of the Commissioners on this point coincided with those of the Board; and a resolution of the Board to that effect was communicated to Mr. H. A. Bruce [now Lord Aberdare], at that time Secretary of State for the Home Department.

In the year 1871, a Bill relating to the London Water Supply was prepared by the Home Department, and introduced into the House of Commons by Mr. G. Shaw Lefevre, then Under-Secretary of State. The Bill made provision for a constant supply of water at high pressure; gave the Companies authority to make regulations with respect to the water pipes and fittings in houses; and proposed that the Board should have power to purchase, compulsorily or by agreement, the interests of the Companies, and ~~thus to~~ become the Water Authority of London. The Board, having carefully considered the provisions of the Bill, came to the conclusion that it was a measure calculated to be beneficial to the inhabitants of London, and especially to the poorer classes of the community. The Bill, however, whilst it received the support of the Board, was not equally acceptable to the Water Companies, for they made representations to the Home Department which led to its withdrawal, and to the introduction of a new Bill much less decided in character. The purchase clauses were omitted, and the Bill was limited to the provisions for a constant supply, the machinery by which this was to be brought into operation, and the conditions under which it was to be given. There were some supplementary provisions relative to the accounts of the Companies and to the appointment of a Water Examiner by the Board of Trade, who was from time to time to examine the water with reference to its purity, and to report the result of his examination to the Board of Trade. The Bill was passed by the House of Commons after a long inquiry by a Select Committee, presided over by Mr. Brand (subsequently Speaker of the House of Commons, and now Viscount Hampden), and shortly afterwards became law under the title of the Metropolis Water Act, 1871. The Act prescribes three modes by which a constant supply of water may be obtained: (1) Any Company may propose to give it; (2) the Metropolitan Authority may call upon a Company to provide it; and (3), failing the above, and under certain conditions, the Board of Trade may require it. The power given to the Board of Trade is now transferred to the Local Government Board. When notice of a constant supply has been given, it is to be published in the *London Gazette* and two daily newspapers; and notice is then to be served by the Water Company on the owners or occupiers of premises within the district, requiring them to supply their premises with the prescribed fittings. If the fittings be not supplied within two months, the Company may, if they think fit, provide them.

The Act provided that every Company should, within six months after the passing of the Act, make regulations for preventing waste, misuse, undue consumption or contamination of water, and should prescribe the size and strength of the pipes, cocks, and other apparatus to be used. The regulations thus made were not to be of any force or effect until submitted to, and confirmed by the Board of Trade, after an enquiry, at which the Metropolitan Authorities and the Companies were to be represented. Regulations were in due course made by all the Companies, and submitted to the Board of Trade; copies of them at the same time being sent to the Metropolitan Board. The settlement of these regulations was of great importance, because, when once confirmed, they were to be binding on all parties; and the Act provided that a Company should not be bound under any agreement to supply or continue to supply water to any person unless the regulations were duly observed. It was, of course, possible for the Companies to make these regulations so stringent as to constitute a heavy and unnecessary burden on the owners and occupiers of houses. And, in fact, the regulations, when the Board came to examine them with the aid of experienced advisers, appeared in several particulars to be so burdensome, that the Board thought it right to prepare a series of counter-regulations calculated to effect the object in view with less expense, trouble, and vexation to householders. The counter-regulations having been submitted to the Board of Trade, an inquiry was resolved upon; and the Duke of Richmond, with Mr. R. Rawlinson and Captain Tyler, undertook, at the request of the Board of Trade, to conduct the inquiry. At the first sitting a question was raised as to the power of the Board of Trade, under the Act, to delegate the inquiry; and the law officers of the Crown having been consulted, it was thought advisable to apply to Parliament for a short Act, declaring that inquiries to be made by the Board of Trade could be legally made by persons duly appointed by that Board for the purpose. An Act to this effect was passed; and, the Duke of Richmond being then unable to undertake the inquiry, Lord Methuen, Mr. Rawlinson, and Captain Tyler were appointed. A thorough investigation was made by the Commissioners, before whom the Companies on the one hand, and the Board and the City Corporation on the other, were represented by counsel; witnesses being produced on both sides. The Commissioners submitted their conclusions to the Board of Trade; and the authorized regulations issued by that department in August, 1872, showed that several important modifications had been made in what the Companies had proposed. The regulations, however, were still of a very stringent character; so much so that the Board felt a difficulty in taking the initiative for a constant supply under such conditions. This feeling has always prevailed with the Board; and the result has been that the Companies have been left to take the initiative, as they are empowered to do under the Act.

The East London Water Company were the first to take action. They gave notice to the Board that on the 25th of March, 1873, a constant supply of water would be given in parts of the parishes of Bethnal Green and Shoreditch. Since then all the London Water Companies, with one exception (the Chelsea Company), have brought the constant service

system into operation in parts of their respective districts, in the manner and under the conditions prescribed by the Act of 1871; and the process is still going on. It may here be mentioned that the Public Health Act of 1872, section 35, transferred to the Local Government Board all the powers given to the Board of Trade by the Water Act of 1871.

In the year 1877, a Select Committee of the House of Commons, appointed to inquire into the management of the Metropolitan Fire Brigade, investigated, among other things, the conditions under which water was supplied for the extinction of fires, and came to the conclusion "that the water systems now belonging to the various Companies should be consolidated in the hands of a public authority, which, in dealing with the questions of constant supply, pressure, and pipeage, should be bound to have regard, not only to the convenience of consumers, but also to the requirements for the extinction of fires." The Board, upon considering the recommendation of the Select Committee, conceived it to be its duty, as the body responsible for the prompt extinction of fires in London, to take measures for obtaining a better supply of water for that purpose. After a lengthened and careful examination, and after consultation with experienced engineers, the Board resolved to ask Parliament for power to establish a new water service at high pressure for the extinction of fires, the water to be drawn from the chalk and other water-bearing strata around London, and to be supplied to householders for drinking and cooking, for which, owing to its freedom from organic impurity, it would be peculiarly fit. It was proposed that the water supplied by the Companies should be used for all other purposes, public and domestic. Two Bills were accordingly introduced into the House of Commons in 1878—one for the new supply, and the other for the purchase of the undertakings of the Water Companies; the Board being of opinion that the Legislature would not allow a separate water service to be established side by side with those of the Companies, unless provision were made for compensating the Companies or for acquiring their undertakings. There was considerable opposition to the scheme for the new supply; and, as regards the Purchase Bill, it became evident that there was no chance of successfully promoting a measure affecting interests of such magnitude, unless it were done with the authority of Her Majesty's Government. Both Bills were, therefore, eventually withdrawn. In November of the same year, the Board had an interview with the Secretary of State for the Home Department, and asked him whether the Government would support a proposal for the purchase by the Board of the undertakings of the London Water Companies if a Bill for the purpose were introduced by the Board the following year. To this request a reply was received in the month of December following, to the effect that the Government did not see its way to further the scheme. At the public audit of the Board's accounts, in which the expense of promoting these two Bills appeared, certain ratepayers came before the Auditor, and argued that the Board, in incurring the expenditure, had acted beyond its powers. They contended that the statutory authority given to the Board by the 144th section of the Act of 1855, to make applications to Parliament, was limited to matters specifically referred to in the section, and did not extend to such questions as the improvement of the water supply of London. The Auditor took the view of the Board's opponents, and disallowed the expenditure incurred in connection with the two Bills. The Auditor's disallowance rendered it necessary for the Board to obtain the special sanction of Parliament to the expenditure; and this was given by a short Act, passed in the year 1879, entitled the "Metropolitan Board of Works (Indemnity) Act."

Early in the session of 1880 a Bill was laid before the House of Commons by Mr. Cross, then Secretary of State for the Home Department, to authorize the purchase of the interests of the London Water Companies, and the future administration of the water service, by a public body to be constituted for the purpose. The terms of purchase proposed in the Bill were provisionally settled with the Water Companies by Mr. E. J. Smith, a Surveyor of high standing in London, acting on behalf of the Home Office. The shareholders of the Companies were to be compensated by annuities in the form of a 3½ per cent. stock, to be called "consolidated water stock," which was to be transferred to them in such amounts as would produce the same annual income as they were deriving from their interests in their respective undertakings; and such amounts of stock were to be further increased by additions to be made at various fixed periods during the succeeding twelve years, as compensation for the prospective increase of the value of their interests. The introduction of this Bill was followed by a great and immediate rise in the value of the Water Companies' shares as quoted on the Stock Exchange, and by a general complaint on the part of the inhabitants of London that the Companies were to receive much more than the value of their undertakings. Some idea of what would have had to be paid to the Companies is given in a report made in the following year by a Select Committee of the House of Commons, to which the agreements made with the Companies were submitted. The report states that the then value of the annuities proposed to be paid to the shareholders, with the addition of the debt that would have to be discharged, was £33,018,836. This was the price to be paid by the public for undertakings, the total cost of which, according to the same report, did not much exceed £12,000,000! Mr. Morley gave notice in the House of Commons that, on the motion for the second reading of the Bill, he would move—"That, in the opinion of this House, the compensation proposed to be given to the Water Companies under the Metropolis Water-Works Purchase Bill is excessive, and will impose an unjust and unnecessary burden on the ratepayers of the Metropolis." So general, however, was the dissatisfaction of the people of London with the arrangement made on their behalf, that the Government saw it would be useless to propose the second reading of the Bill; and the sudden dissolution of Parliament, towards the end of March, 1880, put an end to a measure which, so soon as its provisions were made known, was felt to have no chance of success.

The meeting of the new Parliament in April having been followed by a change of Ministry, the new Home Secretary, Sir W. V. Harcourt, had to consider what course he should take with reference to the provisional agreements made with the Water Companies by his predecessor. After hearing the views of the Board and the other Local Authorities, he proposed to the House of Commons, and the House adopted his proposal, that there should be an inquiry into the subject by a Select Committee. Accordingly, in the beginning of June a Select Committee of seventeen members was appointed, Sir William Harcourt being the Chairman. The Committee had several sittings, in the course of which Mr. E. J. Smith explained the principles by which he had been guided in negotiating with the Water Companies; and the Board and other opponents of the scheme stated their objections. On the 3rd of August following, the Select Committee made its report to the House; the effect of the report, shortly stated, being as follows:—That the supply of water should be under the control of a public body representing the consumers, and that in the absence of any single municipal body to which the functions could be committed, a water authority of a representative character should be constituted, including elements to be derived from the City Corporation and the Metropolitan Board, together with a due representation of the districts outside London which were supplied by the Metropolitan Water Companies; that for certain purposes at least, it would be desirable to acquire the Companies' undertakings, if they could be obtained upon fair terms, but that the terms contained in the provisional agreements with the Companies did not furnish a satisfactory or admissible basis of purchase. The Committee then referred to the nature and extent of the powers of the Companies to levy water-rates on rents, and pointed out that a considerable portion of the increase in the Companies' receipts had been due to the growth in the value of houses; the amount paid by householders for water being increased in proportion to this growth of value, without any augmentation of the quantity or improvement in the quality of the water supplied. In connection with this point, the report referred to the practically unlimited claim advanced by the Companies for back dividends; and stated that if their extreme claims were admitted, the public would be at their mercy, and that the consequence to the consumers of the improvident legislation of the past would be indeed intolerable. It added, however, that Parliament was not unequal to redressing such mischiefs to the public interests.

After the presentation of this report, the Government announced its intention to introduce a Bill in the following year to give effect to the recommendation of the Select Committee that a Metropolitan Water Authority should be constituted. The session of 1881 passed, however, without this being done. Subsequent consideration seems to have led the Government to change its views; for, at the beginning of 1882, Sir William Harcourt, the Home Secretary, intimated, in reply to a question, that it was intended to submit to Parliament a measure for the extension of the municipal government of London, and that it was the expectation and hope of the Government that such a body would be created as would be able to deal with the water supply, as well as with all other questions of interest to the inhabitants of London. A Bill for the municipal government of London, which the Government eventually introduced in the year 1884 was, as is well known, not passed; having been withdrawn after debate on the motion for second reading. Consequently nothing has yet been done towards placing the supply of water in the hands of an authority representing the public.

The Board, seeing no prospect of the question being dealt with at an early date by any other authority, and being of opinion that the time had come when the supply of water in London should be under the control of a body representing the inhabitants, on three subsequent occasions asked Parliament for power to prepare and submit a scheme for the purpose. The request, however, was not granted; and the Board has accordingly been without power to deal with the question. Thus it will be seen that not only was the Government isinclined to take any steps towards placing the supply of water under a representative body, but that all the efforts made by the Board for this purpose have been discouraged, and the necessary powers refused.

In the meantime, the property of the Water Companies went on steadily rising in value year by year, proportionately with the increase in the population and the number of houses. The Board was therefore of opinion that at the first opportunity something should be done to check this continued rise in value, which would necessarily result in augmenting the compensation to be paid to the Companies when the time should eventually come for the purchase of their undertakings. Accordingly, in the year 1885, when two of the Companies were applying to Parliament for further statutory powers, the Board appeared before a Select Committee of the House of Lords, and proposed the insertion of clauses the effect of which would have been to prevent the additional powers resulting in an increased claim for compensation at a future time. The Committee was not then disposed to accept the Board's proposals, which at the time, no doubt, appeared somewhat novel. Neither of the Bills upon which the question was raised was, however, passed—one having been withdrawn, and the other rejected by the Committee. The expenses incurred by the Board in endeavouring to protect the public interests in connection with these Bills were disallowed by the Auditor of the Board's accounts, on the ground that the Board, in the absence of express statutory power, was not entitled to oppose Bills unless they attacked the rights, privileges, or duties of the Board. It was necessary, therefore, for the Board to ask Parliament to sanction the expenditure as it had done in the year 1879 with reference to the two Water Bills introduced by the Board. A clause sanctioning the expenditure was, with the approval of the Treasury, inserted in the Board's Money Bill of 1886, and passed.

The consequence of the Auditor's disallowance of the Board's expenditure was that when, in the year 1886, three of the London Water Companies applied to Parliament for power to raise more money, the Board confined itself to presenting petitions, and refrained from incurring expenditure in appearing by counsel to support the petitions. Fortunately, however, the City Corporation, whose powers are not subject to the same limitation as those of the Board, and which happened to have *locus standi* as a consumer of water in each of the Companies' districts, took up the Board's clauses of the previous year, and went before a Select Committee of the House of Commons, with a request that they might be inserted. The Committee, after hearing arguments and evidence, resolved to subject the three Companies to the conditions proposed; and the Acts provide accordingly. The East London, Lambeth, and Southwark and Vauxhall Water Companies are therefore required to offer their new debenture stock to the public by auction or tender, and any money received by way of premium over and above the nominal value of the stock is not to be considered as profit made by the Company, but is to be applied in extending and improving the works, or in cancelling a proportionate part of the Company's debt, and is not to be considered as part of the capital entitled to dividend. At the end of three years after the issue of the new debenture stock, the Companies are to carry to a sinking fund in each year such percentage on the amount of the stock as shall be equal to the excess of the average percentage of the dividend or interest paid for that year on all the Company's capital over the interest on the new debenture stock, together with an additional 1 per cent. added thereto for management; such sinking fund to be held and applied by the Chamberlain of the City of London, as Trustee, for the purpose of purchasing and extinguishing the Companies' share capital, or such other purpose as Parliament may from time to time determine. It may possibly be thought by the new governing authority of London, that the City Chamberlain is hardly the proper officer to be the Trustee of a fund in which the inhabitants of the whole of London are interested. Subject, however, to any alteration which the Legislature may hereafter see fit to make in this particular arrangement, and pending the arrival of the time when the water supply will be completely under the control of a public body, it is to be hoped that conditions similar to those here mentioned will be applied to every London Water Company seeking further powers.

Reference should here be made to a useful measure passed in the year 1885 at the instance of Mr. W. M. Torrens, one of the representatives of the old borough of Finsbury, the effect of which is to make the annual water-rate leviable on the rateable value of a house instead of, as before, on the annual value. The latter was found to be a phrase of doubtful interpretation, under which the Companies sometimes made claims larger

than they were justified in making, and which caused much confusion and dissatisfaction. Mr. Torrens's Bill was passed under the title of the "Water Rate Definition Act, 1885." Another small but useful measure applicable to the whole of England, was passed in the year 1887, providing that where the owner of a house (and not the occupier) was liable for the water-rate, no company should cut off the supply for non-payment of rate, but that such rate should be a charge upon the house in priority of other charges, and be recoverable from the owner or occupier for the time being. This Bill was introduced by Mr. Forrest J. Fulton, the member for the northern division of West Ham, and was passed under the title of the "Water Companies (Regulation of Powers) Act, 1887."

Although the Board, for the reasons already stated, has not been disposed to call upon the Water Companies to provide a constant supply of water in any district, the Companies themselves have, with the concurrence of the Board, been gradually bringing the system of constant service into operation; and at the present time [end of 1888] the percentage of houses under the constant service system in each Company's district is as follows:—Chelsea, 18; East London, 85; Grand Junction, 78; Kent, 53; Lambeth, 51; New River, 37; Southwark and Vauxhall, 43; West Middlesex, 33. The total number of houses on the constant supply system is stated to be 397,441, or equal to about 53 per cent. of the whole number of houses supplied.

PROPOSED AUGMENTATION OF THE WATER SUPPLY OF EDINBURGH.

As notified in our Edinburgh Correspondent's "Notes," a fortnight since, an exhaustive report has been prepared by Messrs. Leslie and Reid, C.E., the Engineers of the Edinburgh and District Water Trust, on the proposed increase of the water supply of the city and district. It is pointed out that in the past 18 years the daily consumption of water has risen from 8 to 15 million gallons; and if another dry period were to occur the combined Moorfoot and Pentland supplies would be considerably short of the present demands. Assuming an annual increase of population at the present rate, in 1900 the number of persons to be supplied will probably reach 470,000; and the total supply then required would be, at the existing consumption, 18,800,000 gallons. In looking out for an additional supply, it is generally considered advisable, the Engineers say, to select a source which will be capable of ultimately yielding as much water as will double the existing supply. To fulfil this condition, it will be necessary to go to the basin of the Tweed; the available sources being (taking them in the order of their distance from Edinburgh) the Heriot, Lyne, Manor, St. Mary's Loch, and the Tweed, including the Talla and Fruid. From the yield of each district they have in every case deducted one-third for compensation, leaving the balance for the town supply. The storeage capacity of the proposed reservoirs has been taken at 180 days of the total available yield, except in the case of St. Mary's Loch, where less storeage is necessary for the first and second instalments, owing to the whole yield not being utilized; but 180 days are also taken when the final instalment is reached. The Engineers have laid out each scheme so that it may be carried out in instalments as the requirements increase; and while the built aqueducts—which are adopted wherever the nature of the ground will admit of it—are made capable of carrying the ultimate yield of the respective districts, the storeage reservoirs and cast-iron pipes are added as required. In each case comparative estimates are made for delivering the water at Alnwickhill; and, of course, the works necessary for filtration and distribution, which are common to all the schemes, will require to be added. Proceeding to treat of the Heriot and Lyne schemes, the Engineers state that as neither of these two schemes would fulfil the conditions as regards quantity which they think should guide the Trustees in fixing on a new source of supply, they have not thought it necessary to treat them in detail. As to the Manor scheme, they say that the gathering-ground of the Manor water, which flows into the Tweed about two miles above Peebles, is very well suited for supplying water for domestic use. The total available drainage area of the Manor amounts to 13,720 acres; and this, with an estimated available rainfall of 26 inches, will afford a supply of 15 million gallons for town supply, after allowing the proper deduction for compensation to the stream. The Engineers propose to introduce the water of the Manor in two instalments—for the first of which 9310 acres of drainage area will be utilized, comprising the Manor Valley above Posso, along with the Glenrath Burn. The cost of this first instalment of 10 million gallons per day, they estimate at £480,000, being at the rate of £48,000 per million gallons. The second instalment of this scheme will be provided by the construction of a compensation reservoir, for which a favourable site can be obtained in the side valley between Hundleshope and Cademuir. It will admit of the whole yield of the Manor, above Posso, amounting to 15 million gallons per day, being made available for town supply. The additional cost of these works will be £184,000; making a total of £664,000, or £42,266 per million gallons per day. The Tweed scheme has for its object the utilization of the head waters of the River Tweed, including its tributaries the Talla and Gameshope, the Menzion and the Fruid, each of which can be dealt with separately as the requirements increase. The ultimate quantity available from this scheme is 24 million gallons; and it is proposed to introduce the water in three equal instalments of about 8 million gallons each. The cost of the first instalment of 8 million gallons per day, with aqueducts and tunnel to carry 24 millions, and cast-iron pipes to carry 8 millions, the Engineers calculate at £510,000; being at the rate of £63,688 per million gallons per day. The additional cost of the second instalment, including an additional line of cast-iron pipes to Alnwickhill, will be £223,000; making a total of £733,000 for 16 millions, being at the rate of £45,800 per million gallons per day. The extra cost of the third instalment of 8 million gallons, including a third line of cast-iron pipes to Alnwickhill, will be £237,000; making a total of £970,000 for 24 millions, or £40,400 per million gallons per day. Referring next to the St. Mary's Loch scheme, the Engineers state that St. Mary's Loch and the Loch of the Lowes have together a drainage area of 27,500 acres, and a water surface of 723 acres. This scheme had so far the advantage over the others under consideration, that storeage capacity can be obtained at a proportionately less cost by operating on the lochs than with wholly artificial reservoirs. This advantage is, however, so far counteracted when they come to deal with the question of compensation, as this drainage area cannot be dealt with in parts, as in the other cases. In order to reduce as much as possible the obligations as to compensation water to be sent down the Yarrow, they propose to reduce the area draining into St. Mary's Loch to 25,500 acres, by diverting direct into the Yarrow the waters of the Kirkstead Burn, which at present enters the loch near the outlet. This operation will also obviate the objection of having the intended outlet for town supply close to the mouth of a tributary stream which is likely to be turbid during floods. The available rainfall over this district is taken at 34 inches; and this, with the reduced drainage area, will give a total yield of 54 million gallons per day, of which 18 millions will be given off for compensation to the Yarrow; leaving 36 millions available for town supply. The Engineers propose to introduce the water in three equal instalments of 12 million gallons each. The cost of the first instalment, including the works at the loch and the purchase of the land, with tunnels and aqueducts to carry 36 million gallons per day, they estimate at £681,000, or £56,700 per million gallons per day. The cost of the second instalment, including the raising of the embankment of the loch to the height necessary for utilizing the whole yield and the purchase of the additional land required, with a second line of cast-iron pipes to Alnwickhill, they estimate at £244,000; making a total of £925,000, or £38,500 per million gallons per day. The cost of the third instalment, involving the laying of a third line of cast-iron pipes to Alnwickhill, is estimated at £140,000; making a total of £1,065,000, or £29,600 per million gallons per day. The St. Mary's Loch scheme might be made to form an extension of the Manor scheme, should this scheme be first adopted; and in this case the water would be drawn from the loch by a tunnel seven miles in length to a point in the Manor Valley, immediately below the embankment of the proposed Posso reservoir, and thence to Alnwickhill by the line proposed for the Manor. The Manor aqueducts could be made large enough in the first instance to carry also the St. Mary's Loch water, at an additional cost of £62,000 above the estimates already given; and in this case the cost of introducing the first instalment of 12 million gallons from St. Mary's loch, in addition to the 15 millions from the Manor, would be £552,000. The second instalment of 12 million gallons would cost £177,400; and the third £73,300 additional. The total cost of the Manor and St. Mary's Loch schemes combined would thus amount to £1,528,000 for a supply of 51 million gallons per day; being at the rate of £30,000 per million gallons per day. In preparing the estimates, the Engineers have adopted, as far as applicable, the prices at which similar works have been actually executed on the Moorfoot Water-Works; and in every case they have allowed for land, way-leave, and surface damage, and a large margin for contingencies. In comparing these estimates with the cost of the Moorfoot works, they point out that the amount expended up to date for 8,700,000 gallons per day, delivered at Alnwickhill, has been £325,000, or £37,300 per million gallons per day. Ground for additional filters has recently been acquired at Alnwickhill; and these can be constructed as required, at the cost of £4000 per million gallons per day; but probably after the reservoirs have been in use for some years, the waters of the scheme reported on will not require filtration to the same extent as the Moorfoot water. An additional clear-water reservoir will probably cost £30,000.

PROPOSED PURCHASE OF THE MANSFIELD WATER-WORKS BY THE IMPROVEMENT COMMISSIONERS.

On Monday evening last week, a meeting was held at Mansfield, for the purpose of considering the negotiations which have taken place between the Improvement Commissioners and the Water Company for the purchase of the water-works. Mr. J. Watt (Chairman of the Commissioners), who presided, said it would be remembered that a meeting was held about twelve months ago with respect to the purchase of the water undertaking by the Commissioners; but the negotiations fell through. They were now in a very different position; and it was for the meeting to say whether or not the Commissioners should conclude the purchase. Mr. Hibbert remarked that, although the attempt to purchase the water-works proved abortive, the Commissioners followed the matter up; considering that it would be to the best interests of the town to have control over the water-works and all other public undertakings connected with the interests of the ratepayers. He believed that if the Commissioners did not purchase the works at the present time, the Company were about to spend a large amount of money; and he was told they would have to pay something like 50s. for every pound spent. He then read a letter from the Directors of the Company offering the works to the Commissioners for £27,000 and £750 on capital account; the works to be taken from Jan. 1, and on whatever profit had been made from that time, they were to allow 3 per cent. interest. The Commissioners had carefully considered the matter, and had come to the conclusion that it was a fair price to be paid for the works; and, therefore, called the present meeting to obtain the approval of the ratepayers. They were told that the profit of the Company was £1200 a year; but there was every probability of this being exceeded. There was no doubt they would have to spend a large amount on the works, as they were certainly not in good condition; but they would not be called upon all at once for a large sum. The Company were about to alter their scale of charges, which would materially increase the revenue; but he believed that, under the control of the Commissioners such a step would not be necessary, and that the increase in revenue would be much larger. He concluded by moving a resolution approving of the negotiations entered into between the Improvement Commissioners and the Water Company for the purchase of the Company's undertaking. Mr. James, in seconding the motion, said it would be remembered that a year ago negotiations were opened with a view to the purchase of the water-works, at which time the Company asked £30,000. The Commissioners offered £24,000, by the advice of their Engineer, which decision was ratified by a public meeting. Since then it had been ascertained that their Engineer's value was only for the works, and the fact that the Company had by Act of Parliament to supply the town with water had been overlooked, so that would have to be taken into consideration. He was also informed that the Company had applied for powers to spend £5000 on the works; and if the town did not now purchase, they would want 7 per cent. at their declared rate of dividend upon this sum. The resolution was carried unanimously.

THE PUBLIC LIGHTING OF BROMLEY.—The public lighting controversy at Bromley appears to be at an end; the Bromley Gas Company having entered into a contract with the Local Board to supply gas to the public lamps at £3 10s. 6d. instead of £3 15s. per lamp per annum.

PROPOSED PURCHASE OF THE WELSHPOOL GAS-WORKS BY THE CORPORATION.—At the meeting of the Welshpool Town Council last Tuesday, the Town Clerk read a letter in reply to one sent by him in virtue of the resolution of the Council at their previous meeting that he should write to the Welshpool Gas Company to know upon what terms they would sell their works to the Corporation. The reply was to the effect that if the Corporation wished to buy, they should make an offer of what they would give for the works. Mr. Pryce moved that the Town Clerk be requested to communicate with the Company, and ask them to make an offer of what they would sell the works for. Mr. D. Jones seconded the motion. Mr. Rogers said they could not purchase the works without getting a great deal of capital. The works were managed well enough at present, and he could not see what the Corporation wanted with them. Mr. C. Mytton said he did not think the Corporation were in a position to purchase the works without borrowing. They were indebted to the bank some £800. It was not to be thought of at present, though it might be at some future time. Mr. W. Rogers proposed, as an amendment, that no further action should be taken in the matter; and it was carried.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

I am obliged to speak with a measure of regret this week at the manner in which the Edinburgh and Leith Gas Commissioners have filled up the position of Superintendent Surveyor. Their quarrel with Mr. Dewar, the previous Superintendent, arose in consequence of Mr. Dewar imagining that he was independent of any other official; whereas the Commissioners intended that he should be subordinate to both the Collector and the Engineer. In order to avoid getting into trouble again, they have resolved that the post shall be made independent; and the appointment has been so made. I think this is a mistake, and that the staff would have worked much more smoothly if the Surveyor's department had been made subordinate to at least the Collector. Having too many independent departments—each jealous of being encroached on by the other, or the staffs of which are afraid lest they should do work which should fall upon others—does not facilitate the transaction of business. Besides in this case, the Commissioners admitted that they made the position for Mr. Dewar, because they had nothing else for him to do. If this was the case when Mr. Dewar left why did they appoint another? The duties are a mere figment—to see that all the men turn out in the morning, and that they rsturn in the afternoon and submit their readings of the meters they have surveyed. A Clerk in the Collector's office could do all that is required of a superintendent, and be of use during the day; whereas the Superintendent they have appointed will be of little or no use, except morning and evening. There is another element of regret in the matter, and that is that Mr. Bauchope, who has been appointed, has only 15 months' experience; whereas there were men in the department who were well qualified to do the work, both on account of experience and abilities.

The report by Mr. W. Foulis, Chief Engineer of the Glasgow Corporation Gas Undertaking, regarding the proposed reconstruction of the Arbroath Gas-Works, has now been published. When seen in detail, it is found that there is almost no difference of opinion between Mr. Foulis and Mr. R. Mitchell, of Edinburgh, who reported on the works last summer. Mr. Mitchell thought it would not be judicious to remove the works to a new site; Mr. Foulis thinks it would be a serious mistake. Mr. Mitchell advised regenerative furnaces, with retorts in settings of five; Mr. Foulis recommends regenerative furnaces, and offers his advice as to the best means of making the necessary alterations. Mr. Mitchell suggested that new purifiers should be procured; Mr. Foulis does the same. Mr. Mitchell proposed that a new main should be laid to the lower district of the town; so does Mr. Foulis. The only difference in their reports is that while Mr. Mitchell advised the construction of a new gasholder, and the telescoping of the larger of the two existing holders, Mr. Foulis, while leaving it open to the Corporation to consider whether the smaller holder might not be repaired, strongly advises them to abandon the present holder, and to erect a large new one, at a cost of £5000, which would give a storeage capacity of 408,000 cubic feet. This scheme leaves it open to the Corporation at any future time to telescope the existing large gasholder, which, Mr. Foulis says, could be done for £2600. The gain which the Corporation have by obtaining a report from Mr. Foulis is therefore that they may make the gas-works efficient by, in the meantime, an expenditure of £2600 less than was estimated by Mr. Mitchell. This scheme, as being the more cautious of the two, was adopted by the Special Sub-Committee on Monday; and the Corporation are to meet next week to consider Mr. Foulis's report and the Committee's recommendation. The objecting members, who are responsible for the delay in going on with the improvements, will probably have a "bad quarter of an hour" at the meeting.

Mr. J. Watson, the Engineer of the Dundee Water Undertaking, reported on Thursday last to the Works Committee of the Water Commissioners, that the new line of water-main from Lintrathen Loch to Pitnappie was now completed. The pipe, he said, had since Sept. 18 last been subjected to pressure tests varying from 150 feet to 505 feet, the latter of which was 15 feet more than the greatest working pressure to which the line could ever be subjected.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

A couple of weeks ago I mentioned that tenders were being taken for a large station meter for the Tradeston Gas-Works, Glasgow, at present undergoing reconstruction and extension; and I am now able to state that the Corporation Gas Committee have let the contract to Messrs. R. Laidlaw and Son, of Edinburgh and Glasgow. The contract for the ironwork of the roof and girders of the new retort-house at these works has been let to Messrs. P. and W. Maclellan, of Glasgow. There is also a new iron bridge to be erected over the Caledonian Railway, tender for which has been placed with Messrs. J. Goodwin and Co., of Motherwell.

Speaking of station meters, I ought to state that the Partick, Hillhead, and Maryhill Gas Company recently placed an order with Messrs. Milne, and Son for a station meter capable of passing 100,000 feet per hour.

By way of providing additional gasholder accommodation at the Dawsholm Gas-Works, it has been resolved by the Glasgow Corporation Gas Committee to act on a recommendation of the Engineer, Mr. W. Foulis, to add another lift to one of the existing holders, which is 160 feet in diameter, with two lifts of 30 feet each, and has a capacity of about 1¼ million cubic feet. There are three such holders at the Dawsholm works, and five at the other two works. These are the largest gasholders yet erected in Scotland.

During January there were some days on which very large deliveries of gas were sent out from the Glasgow Gas-Works. On one occasion 14,002,000 cubic feet were supplied in 24 hours; on another, the deliveries amounted to 15,158,000 cubic feet in a similar period; and on the 10th of that month the amount sent to the consumers almost reached 15,600,000 feet. Twelve, thirteen, and fourteen million feet per 24 hours were not uncommon deliveries. The total make for the month was 400,827,000 cubic feet, as compared with 376,435,000 feet in the corresponding month of last year; so that there was an increase for the month of 24,392,000 feet, or nearly 10 per cent. The average yield of gas per ton of coal was rather more than 9400 cubic feet; but in the corresponding month of 1888, when the coal used was of a richer quality, the yield was about 9800 feet per ton. For the production of gas having an illuminating power of 22 to 23 standard candles, it is found that the rich cannel coals of Lanarkshire and the adjoining counties are not required.

At a special meeting of the Police Commissioners of Denny and Dunnipace on Wednesday evening—Provost Hunter presiding—the offers for the construction of the new water-works were under consideration. Eighteen offers were submitted; and after due deliberation on the matter, the Commissioners agreed to accept the tender of Messrs. Dobbie and Baxter, of Kilsyth. There had evidently been a keen competition to secure the contract; still there was a margin of about £1800 between the lowest and the highest offer.

The question of providing an increased supply of water for Motherwell—which is an important industrial town in the middle ward of Lanarkshire—is now fairly launched; and as a Provisional Order authorizing the carrying out of the plans of the Local Authority has been applied for, it has been found necessary to hold a public inquiry before the Sheriff, which was opened on Thursday. Mr. M'Callum, C.E., who was examined for the promoters, gave some interesting information in support of the scheme. Additional storeage was, he said, the principal feature of the new scheme; and the total cost of it was estimated at £12,000. It would increase the supply from 18 million to 50 million gallons. The population of Motherwell was given as 17,698; and it was proposed to increase the water supply to such an extent as to provide 25 gallons per day per head to a population of 20,000. It was calculated that the additional taxation due to the extended water supply would only be 4½d. per pound of rental. The existing works were constructed in the year 1875.

This has been an active week in the Glasgow pig-iron warrant market. Prices were easy in the early part of the week, but on Thursday and Friday the tone was exceedingly steady, and the best values reported for some time were the order of the day. The improvement is largely due to the solid position in which the trade is at present. There is a very healthy demand for Scotch iron, both for home and for foreign consumption. Scotch warrants were quoted yesterday at noon at 43s. 7d. per ton cash; Cleveland, at 35s. 6d.; and hematite iron, at 46s. 9d. per ton.

In some directions, the prices of coal are not just as firm as they were; but on the whole the trade is in a good condition.

SALES OF SHARES IN THE ELLAND GAS COMPANY.—At Halifax last Wednesday, some £10 shares in the Elland Gas Company sold at prices ranging from £25 4s. to £25 6s.; and some 5 per cent. preference shares (£10) at £12 13s. 6d. per share.

REDUCTIONS IN PRICE.—The Directors of the *Winchester Water and Gas Company* announce a reduction of 3d. per 1000 cubic feet in the price of gas, to take effect from the 1st of April.——The *Sevenoaks Gas Company* will reduce the price of gas by 2d. per 1000 cubic feet from the 1st prox. This will bring down the figure to 3s. 7d., as compared with 5s. a few years ago.——The Directors of the *Rugby Gas Company* purpose reducing the price of gas to private consumers by 2d. per 1000 cubic feet as from Midsummer next, and making a reduction in the charge for the public lighting. The net price will then be 2s. 10d. in Rugby, and 3s. 4d. in the out-districts.——The Directors of the *Solihull Gas Company* purpose reducing the price of gas to 4s. 3d. per 1000 cubic feet from the 1st of July next.——The *Radcliffe and Pilkington Gas Company* have announced a reduction of 2d. per 1000 cubic feet, to take effect from the end of the present quarter.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 427.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	„	7½	Do. 7 p. c.	10	15—14	..	5 7 2
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 8
100,000	20	29 Nov.	10	Bahia, Limited	20	24—26	..	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 8 5
40,000	5	„	7½	Do. New	4	6¼—6¾	..	5 4 2
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	223—238	..	5 3 1
125,000	„	„	8½	Do. New	100	163—168	..	5 4 3
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	46—48	..	4 13 9
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
89,000	10	„	8	Do. 7 p. c.	10	13½—14½	..	5 10 8
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	14—15	+½	5 6 8
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25—27*	..	5 18 6
550,000	Stck.	12 Oct.	13⅜	Commercial, Old Stock	100	267—272	..	5 1 1
130,000	„	„	10½	Do. New do.	100	215—220	..	4 17 9
180,000	„	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 3
557,320	10	13 Dec.	15	Continental Union, Limited	20	48—50	..	5 4 0
243,680	20	„	13	Do. New '69 & '72	14	34—36	..	5 1 6
200,000	20	„	10	Do. 7 p. c. Pref.	20	38—40	..	5 0 0
75,000	Stck.	28 Sept.	10	Crystal Palace District	100	205—215	..	4 13 0
234,060	10	30 Jan.	13	European, Limited	10	25½—26½	..	4 18 1
120,030	10	„	13	Do. New.	7½	18—19	..	5 2 7
354,060	10	„	13	Do. do.	5	12—13	..	5 0 0
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	255—259	..	5 0 5
100,000	„	„	4	Do. B, 4 p. c. max.	100	99—104	..	3 16 11
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	360—365	..	3 15 6
30,000	„	„	5	Do F, 5 p. c. Prf.	100	128—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1. 1
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	170—175	..	4 0 0
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	258—263	..	3 16 1
1,051,150	„	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
294,850	„	„	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	174—179	..	3 7 0
3,600,000	Stck.	14 Nov.	10	Imperial Continental	100	210—214	..	4 13 5
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5—5¼	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	115—117	..	4 5 6
541,920	20	29 Nov.	6	Monte Video, Limited	20	18¼—19½	−¼	6 8 1
150,000	5	29 Nov.	10	Oriental, Limited	5	9½—9¾	..	5 2 7
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,870	10	16 Jan.	4	Pará, Limited	10	5½—6	..	6 13 4
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	12 Oct.	10	San Paulo, Limited	10	15¼—16¾	..	6 1 2
500,000	Stck.	28 Feb.	16½	South Metropolitan, A Stock	100	314-319*	..	5 1 11
1,350,000	„	„	12½	Do. B do.	100	288-242*	..	5 0 2
141,500	„	„	18½	Do. C do.	100	255-265*	..	5 0 0
600,000	„	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—140	..	3 11 5
60,000	5	28 Feb.	11	Tottenham & Edm'ntn, Orig.	5	11—15* *Ex div	..	4 4 0
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	259—264	..	3 8 2
1,730,580	Stck.	12 Oct.	7	East London, Ordinary	100	211—215	+2½	3 5 1
700,000	50	13 Dec.	9	Grand Junction	50	122—126	..	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272—277	..	3 15 9
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	254—259	..	3 9 6
406,200	100	„	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—122	..	3 5 7
500,000	100	14 Feb.	13½	New River, New Shares	100	350—360	..	3 7 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	123—126	..	3 3 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	168—173	+1	3 9 4
126,500	100	„	6	Do. 7½ p. c. do.	100	161—166	..	3 12 3
1,155,066	Stck.	„	10	West Middlesex	100	265—270	..	3 14 1

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 2.

Sulphate of Ammonia.—The lassitude of the market continues, and the "bear" operators are exultant. They dream already of the figures of last year at their lowest point, and are not deficient in practical demonstration of their desires. And while these speculators strangely choose to blame the so-called "bulls" for being responsible for the present decline, by pretending that the latter, compelled to dispose of their stocks, willingly accept any price offered, it is really the "bears" themselves who do the mischief, having long ago intercepted the orders at prices to which the "bulls" are now compelled to come down—the former giving them no chance of selling at fair values. The same method is still carried on, for is not sulphate sold even now to Spanish and French customers, for delivery up to June, at below present values?—the speculators no doubt anticipating the rates of April to June last year to prevail again. That they may be mistaken in this, may be assumed from the small stocks held by consumers everywhere, and from the large requirements in countries where the summer demand is increasing annually; and do not the present heavy shipments show that the general demand is no less? Sulphate to-day for country consumption is cheaper than nitrate—prices being in such cases on a par. There are to-day sellers f.o.b. Hull at £12, and a little below this price at Leith and Liverpool.

LONDON, *March* 2.

Tar Products.—Buyers are still leaving the better products "severely alone." Benzol and anthracene are, at the moment, absolutely unsaleable at current quotations. Both these articles have, during the week, declined in value; and to-day's quotations are purely nominal. Prices are: Tar, 18s. to 23s. per ton. Benzol, 90 per cent., 2s. 10½d. per gallon; 50 per cent., 2s. 2½d. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha (50 per cent.), 1s. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 20s. to 23s. per ton, according to position. Carbolic acid (crude), 3s. 10d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 17s. per ton. Anthracene (30 per cent.), "A" quality, 1s. 3d. per unit; "B" quality, 1s. 1d.

Ammonia Products.—The sulphate market is still in the hands of the "bears;" and the severe weather, together with the action of some weak holders, have assisted the operations of these gentlemen; but with the advent of better weather, sulphate is sure to see higher values. Prices going for the week for the sulphate have ranged between £11 17s. 6d. and £12 2s. 6d. per ton. Other prices may be taken as follows:—Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3d. to 4d. per lb. Muriate of ammonia, brown, £19 per ton; white, £25 per ton. Sal-ammoniac, £30 to £33 per ton.

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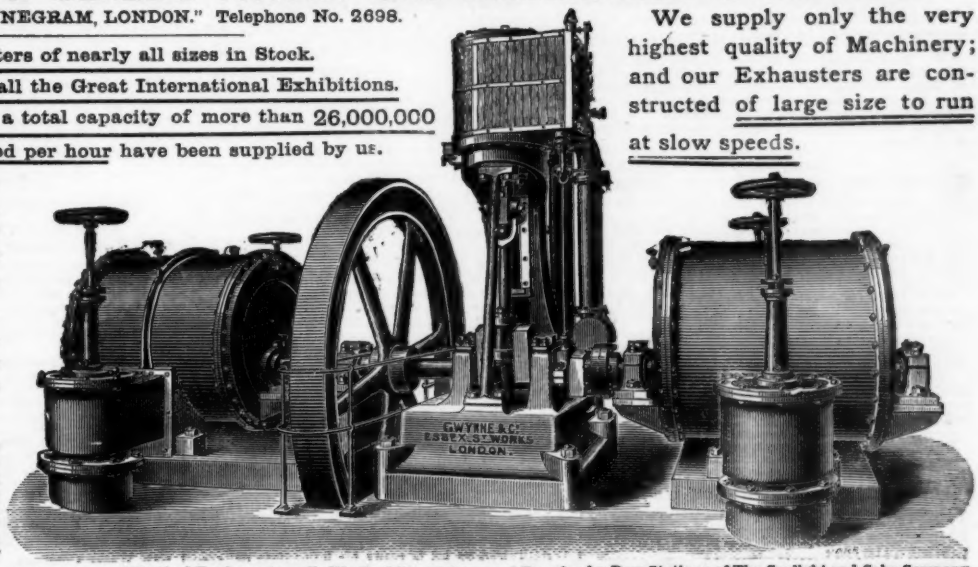

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*** See Advertisement on Page III. of the Wrapper of last week's issue.

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AN old-established English Company in London, having first-class Representatives throughout the United Kingdom, and facilities for introducing immediately any genuine Improvement connected with Gas or Oil Lighting, Heating, Gas Fittings or Apparatus, is open to treat with parties having such Inventions, with a view of taking up a Sole Agency.
Send full particulars to "LIGHTING," 104, Regency Street, LONDON, S.W.

WANTED, a Situation as practical MANAGER of Tar and Ammonia Works, or to Superintend the Erection of same. No objection to go abroad. Best of references.
Address No. 1679, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
*** See large Advertisement in last week's issue, page 378.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol. References given to Gas Companies.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantities at highest market prices, or contracts for the year.
For price and terms apply Botolph House, Eastcheap, LONDON, E.C.

WANTED, by a total abstainer, a Situa- tion in a small Gas-Works, making from 4 to 8 millions, as WORKING MANAGER or FOREMAN. Has had Six years' experience; carbonizing over 3 millions, Main and Service Laying, Smithing, Reading Meters, and all repairs. Age 36; married.
Address No. 1676, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Second-hand Centre-VALVE, 14 inch to 18 inch

Price and particulars to SAML. WHILE, 60, Queen Victoria Street, LONDON, E.C.

WANTED, Two second-hand Purifiers, about 6 feet square, with 5 or 6 inch Valves and Connections, also Lifting Gear complete.

Send particulars to Mr. P. SIMPSON, Gas-Works, RUGBY.

TO GASHOLDER MAKERS AND OTHERS.

WANTED, by the Tetbury Gas Company, Limited, a second-hand GASHOLDER to contain about 16,000 cubic feet. Must be in good condition, and available for use during the ensuing Summer.

For further particulars, apply to the MANAGER, Gas-Works, Tetbury, GLOUCESTERSHIRE.

WANTED, at Lady-day, a practical Gas MANAGER and SECRETARY combined, to take entire charge and work of the Winchcombe Gas-Works. House, Gas, and Coal found.

Apply, stating age, experience, salary required, and testimonials, on or before March 9, to GEORGE TOVEY, Advertising Agent, Winchcombe, GLOUCESTERSHIRE.

WANTED, by a large Provincial Gas Company, a good RETORT SETTER. Must be a steady and industrious man, capable of taking charge of other men when required, and working from drawings. Wages, 38s. per week.

Address No. 1680, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for the Hartley Wintney Gas-Works, near Winchfield, Hants, a MAN to take charge of the Works. Must be a Fitter, and able to repair the Tools. Wages, for the four Winter Months, 24s.; the eight Summer Months, 20s. per week, with House, Garden, Gas, and Firing.

Apply to Mr. KENWARD, Hartley Wintney, Winchfield, HANTS.

ELLAND-CUM-GREETLAND GAS COMPANY.

WANTED, an experienced Manager and SECRETARY, to take charge of the Gas Works and General Business of the Company.

His whole time must be devoted to the duties of the office; and he must be thoroughly conversant with the most modern and approved Methods of the Manufacture and Distribution of Gas and Keeping of Accounts.

He must be competent to design and prepare plans for and carry out all constructive works and alterations that may be required.

The make of Gas is about 70 million cubic feet.

Salary, £200 per annum, with Residence at the Works, Coal, Gas, and Rates free.

Applications, stating age, qualifications, and present employment, with three testimonials of recent date, must be sent to the Chairman not later than March 12, 1889, endorsed "Gas Manager."

H. S. PIKE, Secretary.

Gas-Works, Elland, March 1, 1889.

GLASGOW CORPORATION GAS.

THE Glasgow Corporation Gas Commissioners are prepared to receive TENDERS for the Construction of an additional LIFT to a GAS-HOLDER, 160 feet in diameter, at their Gas-Works at Dawsholm, Maryhill.

Forms of tender may be obtained, and plans and specification seen, at the Gas Office, 42, Virginia Street, Glasgow.

Sealed offers, marked "Tender for Lift to Gasholder," and addressed to the subscriber, will be received at the Gas Office, on or before Tuesday, the 19th inst.

The Commissioners do not bind themselves to accept the lowest or any offer.

J. D. MARWICK, Town Clerk.

City Chambers, Glasgow, March 1, 1889.

GLASGOW CORPORATION GAS.

RESIDUAL PRODUCTS FOR SALE, AND RESIDUAL PRODUCT WORKS TO LEASE.

THE Glasgow Corporation Gas Commissioners are prepared to receive TENDERS for (1) the purchase of the TAR and AMMONIACAL LIQUOR produced at the Tradeston Gas-Works, from and after the 15th of May, 1889; and (2) the purchase of the TAR and AMMONIACAL LIQUOR produced at the Dawsholm Gas-Works from and after the 1st of July, 1889, and a lease of the RESIDUAL PRODUCT WORKS belonging to the Commissioners, adjacent to the Gas-Works, from and after same date.

Forms of tender, on which offers must be made, and copies of the "Terms and Conditions" upon which the Products are to be sold and the Residual Product Works are to be let, may be had on application to the Manager, at the Gas Office, 42, Virginia Street, Glasgow; and offers, endorsed "Tender for Tradeston Residual Products," or "Tender for Dawsholm Residual Products and Works," will be received by the subscriber, on or before Tuesday, the 26th of March next.

The Commissioners do not bind themselves to accept the highest or any tender.

J. D. MARWICK, Town Clerk.

City Chambers, Glasgow, Feb. 27, 1889.

WANTED, a Second-hand Gasholder, 50 feet diameter, with or without Iron Tank. Also Two PURIFIERS, 7 to 8 feet square.

Particulars to HENRY DENNIS, Engineer's Office, RUABON.

PURIFIERS.

WANTED, One or Two Second-hand PURIFIERS, about 6 or 8 feet, for Works in Hants.

Send particulars of Fittings and Valves, and Cash Price to No. 1681, care of Mr. King, 11, Bolt Court FLEET STREET, E.C.

CROYDON GAS COMPANY.

IMPORTANT SALE OF SHARES.

MESSRS. HOOKER & WEBB have received instructions to SELL BY AUCTION at the Greyhound Hotel, Croydon, on Thursday, the 14th of March, 1889, at 6 o'clock precisely, in suitable lots

156 FULLY-PAID SHARES IN THE CROYDON GAS COMPANY,

at present paying dividends at the rate of 14 and 11 per cent. per annum.

The high standing of this Company, its excellent management, and with the prospect of increasing dividends, render the Shares a desirable Investment for large or small sums.

Particulars and conditions of Sale may be had at the Greyhound Hotel, and of the AUCTIONEERS, 4, High Street, CROYDON.

HAMPTON COURT GAS COMPANY.

FIRST-CLASS INVESTMENTS IN GAS SHARES.

MESSRS. EDWIN FOX & BOUSFIELD will include in their SALE at the Mart, on Wednesday, the 20th of March, at Two o'clock, in Lots, INVESTMENTS in first-class GAS SHARES, comprising 259 £10 "A" Ten per Cent. fully-paid Shares, and 208 £10 "B" Seven per Cent. fully-paid Shares in the Hampton Court Gas Company—a well-established and sound undertaking, meeting the requirements of a large and improving residential locality. The maximum Dividends have been paid for some time past.

Particulars at the MART; of Messrs. WALKER and MEWBURN-WALKER, Solicitors, 12, FURNIVAL'S INN, E.C.; and of Messrs. EDWIN FOX and BOUSFIELD, 99, Gresham Street, BANK, E.C.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Victoria New-market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR and LIQUOR made at their Works during the ensuing Twelve months, ending March 25, 1890.

Tenders, stating price per thousand gallons, delivered free on rails at Newmarket Station, to be sent to the undersigned on or before March 7, 1889.

The Directors do not bind themselves to accept the highest or any tender.

By order,

THOMAS WILKINSON,
Manager and Secretary.

Gas-Works, Newmarket, Feb. 21, 1889.

SPENT OXIDE OF IRON.

THE Reading Gas Company invite TENDERS, at a price per ton, for about 500 to 600 tons (more or less) of SPENT OXIDE OF IRON (O'Neill's). The lot is ready for immediate delivery, and may be seen, or a small parcel—approximate in quality of the whole lot—will be forwarded.

Payment, cash on delivery.

The Company will undertake to deliver the Oxide into Barges on the River Kennet (alongside the Gas-Works), which is close to, and adjoining the River Thames.

Further particulars may be obtained on application.

Tenders, endorsed "Spent Oxide," to be addressed to the undersigned, on or before the 11th day of March next.

EDWARD BAKER, Engineer and Manager.

Reading Gas-Works, Feb. 18, 1889.

METROPOLIS LOCAL MANAGEMENT ACTS.

THE St. Luke's (Middlesex) Vestry are prepared to consider TENDERS for the undermentioned Works, agreeably with specifications, &c., prepared by the Surveyor, viz.:—

Gas-fitter's Work, and the supply of Sewer Ironwork, for the respective periods of One year and Three years from Lady-day next.

Asphalte Carriageway Paving Works in Moor Lane and Hatfield Street.

York Stone Footway Paving Works in Chiswell Street and Goswell Road.

Forms of tender for the Gas-fitter's Work and Sewer Ironwork, and particulars generally, can be obtained on application to the Surveyor's Department any day between the hours of Ten and Four, and on payment of the Price fixed by the Vestry for each form.

The tenders should be delivered to me on the 12th of March prox., endorsed "Gas-fitter's Work," "Ironwork," "Carriageway (or Footway) Paving," as the case may be.

GEORGE WHITEHEAD PRESTON, Clerk.

St. Luke's Vestry Hall, City Road, E.C.,
Feb. 28, 1889.

THE Ramsey Gaslight Company, Isle of Man, invite TENDERS for a Cast-Iron SCRUBBER 5 feet diameter and 30 feet high, complete with 8-inch Bye-pass Valves and Connections, and Water Distributor. Delivered and fixed at Works.

They also require a Second-hand PURIFIER, 8-inch Connections, from 7 to 10 feet square.

Tenders to be forwarded on or before the 11th of March.

The lowest not necessarily accepted.

NORTH BIERLEY GAS COMPANY.

THE Directors of the above Company invite TENDERS for the purchase of all the AMMONIACAL LIQUOR of 5° Twaddle, and also the surplus TAR produced at their Works, for One year, from the 1st day of April, 1889, put on rail at Low Moor Station, or led in barrels from the Works by the Contractor.

Tenders, sealed, and endorsed "Tender for Ammoniacal Liquor or Tar," to be sent to this Office on or before the 12th day of March, 1889.

Further information may be obtained on application to Mr. W. Oldfield, Manager.

The Directors do not bind themselves to accept the highest or any tender.

By order,

EPHRAIM SUCKSMITH, Secretary.

Gas-Works, Oakenshaw, near Bradford,
March 1, 1889.

SPENT OXIDE OF IRON.

THE Brighouse Local Board are pre-pared to receive TENDERS for the purchase of about 70 tons of SPENT OXIDE of IRON, now lying at the Gas-Works ready for immediate delivery.

Payment, cash on delivery.

The Local Board will deliver the Oxide into barges on the Calder and Hebble Canal (alongside the Gas-Works), or into railway trucks at Brighouse Station.

Further particulars and sample can be obtained upon application to the undersigned.

Tenders are to be sent in, addressed to Richard Kershaw, Esq., Chairman of the Local Board, Public Offices, Brighouse, on or before Wednesday, the 20th day of March, 1889, endorsed on the outside "Spent Oxide."

JAMES PARKINSON,
Engineer and Manager.

Public Offices, Brighouse, March 1, 1889.

CORPORATION OF BURNLEY.

THE Gas Committee of the above Cor-poration invite TENDERS for the purchase of TAR to be produced at their Gas-Works during the year ending the 25th of March, 1890.

Approximate quantity, 2000 tons.

The Tar will be delivered into the Contractor's boats at the Gas-Works Wharf, on the Leeds and Liverpool Canal.

The Contractor will be required to deposit the sum of £500 as security for the due fulfilment of the Contract.

Tenders, under seal, endorsed "Tender for TAR," stating price per ton, to be addressed to the Chairman of the Gas Committee, and delivered at the Town Hall, Burnley, on or before Wednesday, the 13th inst.

WALTER SOUTHERN, Town Clerk.

Town Hall, Burnley, March 1, 1889.

HARTLEPOOL GAS AND WATER COMPANY.

RETORT-FITTINGS, ETC.

THE Directors of the Hartlepool Gas and Water Company are prepared to receive TENDERS for the supply of RETORT-FITTINGS required in the erection of 56 additional Retorts at their West Hartlepool Works.

Plans and specifications may be seen, copies of same obtained, together with any further information, upon application to the Company's Engineer, Mr. Thomas Bower.

Tenders, sealed and endorsed "Tender for Retort-Fittings," to be sent to the undersigned not later than Tuesday, the 12th day of March next.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS TREWHITT, Secretary.

Hartlepool Gas and Water Company's Offices,
West Hartlepool, Feb. 19, 1889.

BOLTON CORPORATION GAS DEPARTMENT.

TENDERS WANTED.

THE Bolton Corporation Gas Depart-ment are prepared to receive TENDERS for a Supply, during the year ending the 25th of March, 1890, of any of the undermentioned articles, viz:—

Fire-Clay Retorts, Bricks, &c.	Wrought-Iron Tubes and Fittings.
Cast-Iron Pipes.	Lime.
Lead Tube.	Sulphuric Acid (Brown Vitriol).
Gas-Meters.	

Particulars may be obtained on application to the Office Superintendent (Mr. Walsh), Gas Offices, Bolton.

Sealed tenders, endorsed "Tender for ," stating price and terms delivered, to be addressed to Mr. Alderman Miles, J.P., Chairman, and delivered at the Gas Offices, on or before Thursday, the 14th of March, 1889.

By order,

R. G. HINNELL, Town Clerk.

Town Hall, Bolton, March 1, 1889.

SIXTH YEAR. Now Ready (Demy 8vo., Price 5s., or 5s. 6d. post free),

THE COMPLETE REPORTS OF THE PROCEEDINGS

OF THE VARIOUS

DISTRICT ASSOCIATIONS OF GAS MANAGERS

FOR 1888.

FORMIN A COMPANION VOLUME TO THE TRANSACTIONS OF THE GAS INSTITUTE, WITH WHICH IT IS UNIFORM IN SIZE.

. THE VOLUMES for 1883 to 1887 ARE STILL ON SALE.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

COCKERMOUTH LOCAL BOARD.

TAR AND AMMONIACAL LIQUOR.

THE Cockermouth Local Board invite TENDERS for the Surplus TAR and LIQUOR produced at their Works during Twelve months commencing the 1st of April next.

Further particulars on application to the undersigned.

Tenders, endorsed "Tar and Liquor," to be addressed to the Chairman of the Gas Committee, and delivered at the Gas-Works, not later than Thursday, the 14th of March.

By order,
E. W. SMITH, Manager.

THE EDINBURGH AND LEITH CORPORATIONS GAS.

THE Commissioners invite Tenders for the Supply and Erection of RETORT-HOUSE and COAL-SHED ROOFS and HIGH-LEVEL RAILWAY; and also for relative SLATER and GLAZIER WORK at their Gas-Works, New Street, Edinburgh.

Specifications and Drawings may be had from Mr. Mitchell, Engineer at these Works, on payment of Two Guineas. Unsuccessful Contractors who send in *bond fide* offers will get back their £2 2s. on return of the Drawings.

Sealed tenders, marked "Tender for Work at Gas-Works, New Street," will be received up till Ten o'clock on Monday forenoon, the 11th prox., by

JAMES M'G. JACK,
Clerk to the Commissioners.

39, Frederick Street, Edinburgh,
Feb. 25, 1889.

TO GASHOLDER MAKERS.

THE Gas Committee of the Leigh Local Board invite TENDERS for the Construction and Erection of a TELESCOPIC GASHOLDER, 100 feet diameter, and 56 feet deep.

Drawings may be seen and a copy of Specification obtained—on payment of two guineas, which will be returned on receipt of a *bond fide* tender—on application to the undersigned.

Sealed tenders, endorsed "Holder," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 11th of March next.

The lowest or any tender not necessarily accepted.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs., Feb. 19, 1889.

TO RETORT MAKERS.

THE Gas Committee of the Leigh Local Board invite TENDERS for 76 MACHINE-MADE RETORTS and a quantity of FIRE-BRICKS and CLAY.

Sealed tenders, endorsed "Retorts," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 11th of March next.

The lowest or any tender not necessarily accepted.

Further particulars on application to

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs., Feb. 19, 1889.

GASHOLDER AND TANK REQUIRED.

THE Skelmanthorpe Gas Company, Limited, near Huddersfield, invite TENDERS for a GASHOLDER and TANK, with all necessary Columns, Girders, Valves, Inlet and Outlet Pipes, (9-inch), &c., complete. Size of holder: 48 feet diameter; 16 feet deep.

Further particulars may be had of Mr. John Booth, Manager at the Works.

Tenders should be accompanied by detailed plans and specifications, for which no payment will be made.

Tenders to be addressed to the Chairman of the Company not later than the 21st day of March, 1889.

The Company do not bind themselves to accept the lowest or any tender.

By order,
HENRY WADSWORTH, Secretary.

CORPORATION OF LEICESTER.
(AYLESTONE ROAD WORKS.)

CAST-IRON FLOOR-PLATES AND COLUMNS.
SECTION No. 2.—CONTRACT No. 11.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Manufacture, Delivery, and Erection of CAST-IRON FLOOR-PLATES and COLUMNS.

Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Floor-Plates and Columns," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 9 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, Feb. 14, 1889.

CORPORATION OF LEICESTER.
(AYLESTONE ROAD WORKS.)

ROLLED STEEL JOISTS.
SECTION No. 2.—CONTRACT No. 12.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Manufacture, Delivery, and Erection of ROLLED STEEL JOISTS.

Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which will be returned upon the receipt of a *bond fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Rolled Steel Joists," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, March 9 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, Feb. 14, 1889.

TO IRONFOUNDERS.

THE Directors of the Clayton, Allerton, and Thornton Gas Company are prepared to receive TENDERS for the supply and delivery of about 670 yards of 6-inch and 330 yards of 9-inch SOCKET PIPES; also IRREGULARS.

Particulars may be obtained from the Company's Engineer.

Tenders to be sent in, addressed to the Chairman of the Company, at the Gas-Works, Clayton, near Bradford, endorsed "Tender for Pipes," on or before Monday, the 11th of March, 1889.

By order,
JOHN NIVEN, Engineer.

February, 1889.

BRISTOL WATER-WORKS COMPANY.

Issue of £160,000 Three-and-a-Half per Cent. Perpetual Debenture Stock, Interest payable half yearly, authorized by "The Bristol Water-Works Act, 1882," and "The Bristol Water-Works Act, 1888."

THE Directors of the Bristol Water- Works Company give notice that they are prepared to receive, on Thursday, the 14th of March, 1889, TENDERS for £100,000 PERPETUAL DEBENTURE STOCK.

According to the last Annual Account, the Net Revenue of the Company exceeded £60,000; and the Interest payable on Capital ranking before the Debenture Stock now offered amounts only to £8840.

The minimum price below which no tender will be accepted has been fixed at £105 for every £100 of Stock.

Tenders must be delivered at the Secretary's Office, Bristol Water-Works Company, Small Street, Bristol, before Two o'clock on the above day, accompanied by a deposit of £5 per cent. on the nominal amount of the Stock tendered for. Where no allotment is made, the deposit will be returned.

In the event of the receipt of tenders for a larger amount of Stock than that to be issued, at or above the minimum price, the tenders at the lowest price accepted will be subject to a *pro rata* diminution.

The dates on which further payments on account of the Debenture Stock will be required are as follows:—

On Monday, the 1st of April, 1889, so much as when added to the deposit will leave £75 (sterling) to be paid for each £100 of Stock.
On Wednesday, the 1st of May, 1889, £25 per cent.
On Saturday, the 1st of June, 1889, £25 per cent.
On Monday, the 1st of July, 1889, £25 per cent.

Payments may be made in anticipation if preferred, and will carry interest thereupon.

By the Debenture Stock Act, 1871, it is provided that when a power has been given or shall be given to Trustees to invest Trust Funds in Mortgages or in Bonds of a Company, such power shall include a power to invest such sums in Debenture Stock.

Applications must be made upon printed forms, which may be obtained in London of Messrs. Prescott, Cave, Buxton, Loder, and Co., Bankers; or Messrs. Lloyds, Barnetts, and Bosanquet's Bank, Limited; and in Bristol of Messrs. Miles, Cave, Baillie, and Co., Bankers; or at the Company's Offices, Small Street, Bristol.

Bristol, Feb. 25, 1889.

C. & W. Walker

Gasholders. —— Purifiers,

Purifying Machines,

C. O₂ & Tar extracting Washers.—Scrubbers,

Sulphate and Sulphur Plants,

Retort Mouthpieces, Condensers, Lifting apparatus,
Centre and Four way Valves, Slide valves, &c. &c.
Wood sieves, and Tar Burners.

Addresses: 8, Finsbury Circus, London.
Midland Works, Donnington, Salop.

Telegraphic address—Fortress London or Fortress Donnington.

HALIFAX CORPORATION GAS-WORKS.

TO GASHOLDER MAKERS.

THE Corporation of Halifax are prepared to receive TENDERS for the RECONSTRUCTION of the INNER LIFT of their No. 2 GASHOLDER.

The drawings may be seen, and the specification and forms of tender obtained, on application to Mr. Thomas Holgate, Gas Engineer, Gas-Works, Halifax.

Sealed tenders, endorsed "Gasholder," to be delivered to the undersigned not later than Thursday, the 7th of March, 1889.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

Town Hall, Halifax, Feb. 27, 1889.

TO ENGINEERS.

NOTICE is hereby given that the Halstead Local Board of Health are prepared to receive TENDERS for the Supply and Erection of PUMPING MACHINERY, together with other Work in connection with the new Water Supply for the Town of Halstead, in the county of Essex.

The drawings may be inspected and copies of the specification, bill of quantities, and form of tender obtained, on and after Monday, March 4, between the hours of Ten and Four, at the Chambers of Mr. Jabez Church, M. Inst. C.E., 55, Parliament Street, Westminster, London, S.W., the Engineer to the Local Board, upon payment of £5, which (except in the case of the party whose tender is accepted) will be returned to the persons sending in a *bond fide* tender and returning the specification.

Sealed tenders, endorsed "Tender for Pumping Machinery, &c.," addressed to the undersigned, to be delivered not later than Ten o'clock on Monday, the 11th day of March next.

The Local Board do not bind themselves to accept the lowest or any tender.

ROBT. MORTON,
Clerk to the said Local Board.

Halstead, Essex, Feb. 26, 1889.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Padiham and Hapton Local Board invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR, produced at their Gas-Works, during the year ending March 25, 1890.

For particulars, apply to the undersigned.

J. R. SMITH,
Clerk to the Board.

Padiham, Feb. 27, 1889.

CORPORATION OF STALYBRIDGE.

FIRE-CLAY GOODS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for Repairs during the next Twelve months.

Specification may be had on application at the Corporation Offices, Gas Street, Stalybridge.

Tenders, addressed to Mr. Alderman Atkinson, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Tuesday, the 26th of March.

ERNEST A. LOAM,
Engineer and Manager.

Gas-Works, Stalybridge,
Feb. 27, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

ROBERT MARSHALL,
CANNEL COAL MERCHANT
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced

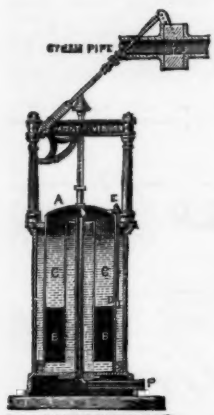
THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

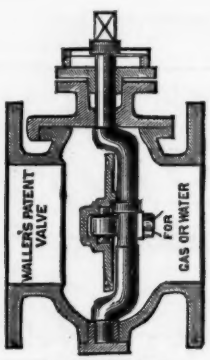
GEORGE WALLER & Co.'s NEW PATENT EXHAUSTER.

MADE WITH FOUR OR THREE BLADES.

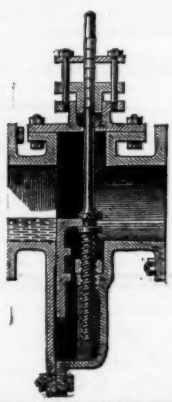
Also BEALE'S EXHAUSTERS.



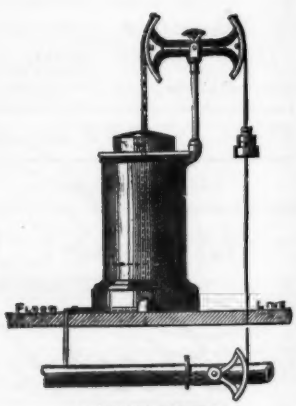
PATENT GOVERNOR.



CRANK VALVE.

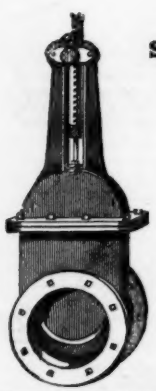


HYDRAULIC MAIN VALVE.

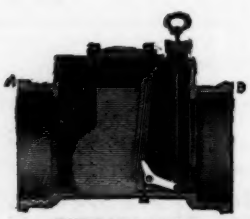


GAS GOVERNOR.

SCRUBBERS, PURIFIERS, CONDENSERS,
COKE-BREAKERS.



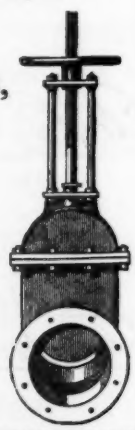
OUTSIDE RACK-VALVE.



BYE-PASS VALVE.

INDEX VALVE.

DISC VALVE.



OUTSIDE SCREW VALVE.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,
NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT
STROUD, GLOUCESTERSHIRE.

TROTTER, HAINES, & GORBETT,
BRETTELLS' ESTATE
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK,
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire GANNISTER BRICKS.
ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

THE ONLY RELIABLE
DRY CENTRE-VALVE.
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
F. WECK, 86, NEW STREET, BIRMINGHAM.

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

THE
LANEMARK COAL Co., LTD.,
Now offer their superior
GAS COALS

LANEMARK CANNEL.
Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
Coke per ton . . . . 1266·96 lbs.

LANEMARK GAS COAL.
Yield of Gas per ton . . 11,379 cub. ft.
Illuminating Power . . 17·88 candles.
Coke per ton . . . . 1285·53 lbs.

LANEMARK GAS BRIQUETTES.
Yield of Gas per ton . . 10,734 cub. ft.
Illuminating Power . . 22·70 candles.
Coke per ton . . . . . 1320 lbs.

For Prices and Analyses apply to
LANEMARK COAL Co., Ltd.,
NEW CUMNOCK, N.B.

CAST-IRON PIPES
FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

PATENT
ARTIFICIAL PEROXIDE OF IRON,
LUX MASS,
IN USE AT
BERLIN, VIENNA,
PARIS, COPENHAGEN, STOCKHOLM,
BUCHAREST, &c., &c.
FRIEDRICH LUX,
142, GREAT PORTLAND STREET,
LONDON, W.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF AND SPRING WORKS
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNER RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

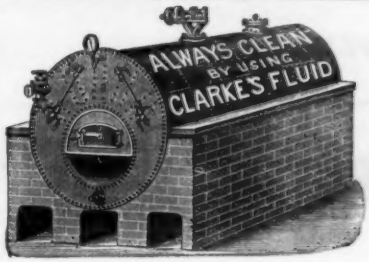
Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD
CANNEL.
Yield of Gas per ton . . . . . 13155 cub. ft.
Illuminating Power . . . . . 38·22 candles
Coke per ton . . . . . 1,301·88 lbs.
EAST PONTOP
GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.
For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

TAR AND LIQUOR PURCHASED
JOHN CLARKSON MAJOR,
(*Established 1851,*)
Tar Distiller and Manufacturing Chemist,
WOLVERHAMPTON.
BRANCH WORKS:—
SCULCOATS, HULL.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.



A 10-H.P. BOILER
KEPT PERFECTLY CLEAN FOR
ONE SHILLING PER WEEK
And much smaller Coal Bills. Softens the Hardest Water, and keeps Gauge-Glasses quite clear.
H. CLARKE & Co., Ld., Ipswich.

Jos. EVANS & SONS
WOLVERHAMPTON.
PUMPS
FOR
STEAM AND OTHER POWER.

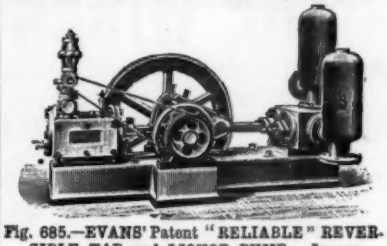


Fig. 685.—EVANS' Patent "RELIABLE" REVERSIBLE TAR and LIQUOR PUMP. In use everywhere. The Best in the World.

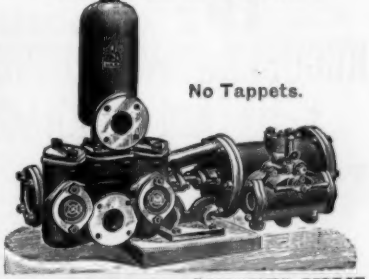


Fig. 600.—EVANS' Patent "CORNISH" DIRECT-ACTING STEAM-PUMP. FOR EVERY PURPOSE.
SEE NEW CATALOGUE.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

SILICA
OR
GANISTER BRICKS
OF VARIOUS SIZES,
GROUND GANISTER, FIRE-BRICKS, &c.
SUPPLIED FROM
PEASE'S WEST WORKS, CROOK, BY
PEASE & PARTNERS, Limited,
DARLINGTON.

IMPROVED RETORT SETTING.
W. G. WALLER & Co.,
RETORT SETTERS & CONTRACTORS,
Having had much experience in the Setting of Retorts, beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.
Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.
Estimates on application.
The Poplars, Waddon, Croydon, Surrey.

GAS AND WATER PIPES.
1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

TELESCOPIC EXTENSION LADDERS & STEPS. All sizes, many patterns, large stock for all purposes, indoor and outdoor. Admirable inventions.
HEATHMAN & CO.,
2, Endell St., & 11, High St., Bloomsbury, London, W.C.

GAS COAL.
POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12¼ cwt. of good coke.
This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

ATTERTON'S
PATENT APPARATUS FOR CHARGING GAS-RETORTS.
Great saving of time in charging. ONE MAN CAN WORK IT.
PRICE COMPLETE . . . £10 10s.
Write for further particulars to the Maker—
JOHN ATTERTON,
Engineer,
Haverhill, Suffolk.
Or to the London Agents—
THE THAMES BANK IRON COMPANY,
Upper Ground Street
(Where one is erected).

RUSCOE'S PATENT MACHINE
FOR DRILLING AND TAPPING WATER MAINS AND GAS MAINS UNDER PRESSURE.
Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.
Sole Maker of HELPS' PATENT PIPE EXTRACTOR.
Prices and Particulars on Application to
JOHN RUSCOE, Albion Works, Hyde, near Manchester.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN, BIRMINGHAM." TELEPHONE No. 200.

SPECIALITIES.
THE "NUGENT" RECUPERATIVE RETORT SETTINGS and FURNACES.
"ROBUS" IMPROVED RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.
THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.
Every Particular, with Estimates, forwarded upon Application to
MESSRS. J. & H. ROBUS,
CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,
37, WALBROOK, LONDON, E.C.

HISLOP'S PATENT
GAS PRODUCER AND REGENERATIVE SYSTEM OF HEATING RETORTS.

The Patentee's Settings on the Shallow Sunk Chamber Plan,
AND OF FROM
One to Eight Retorts per Oven,

Are at once the most inexpensive and efficacious that can possibly be devised, and are giving absolute satisfaction where in use. By a new and improved means, the Producers of all Settings are now filled directly from the Retorts.

Particulars from the Patentee's Agent for England, J. E. FISHER, Esq., Stourbridge, or from the Patentee,
G. R. HISLOP, F.C.S., &c., Engineer, GAS-WORKS, PAISLEY, N.B.

JOHN BROWN & CO., LIMITED,
ATLAS STEEL AND IRON WORKS, SHEFFIELD,
ALDWARKE MAIN GAS COAL.
This Coal yields 12,600 feet of 19-candle gas per ton.
Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

Glass-House Furnace Bricks.
BLAST-FURNACE BRICKS.
Best Staffordshire Blue Bricks.
Please address "MOBBERLEY & PERRY, STOURBRIDGE," as there are other Firms similar in name.

FIRE BRICKS · GAS RETORTS
LARGE STOCKS ON HAND
SILICA BRICKS & BLOCKS FOR INTENSE HEATS

CASTINGS & EVERY REQUISITE FOR GAS WORKS
LARGE STOCKS ON HAND
MOBBERLEY & PERRY

STOURBRIDGE
SPECIAL BRICKS FOR SECONDARY AIR SUPPLY & REGENERATOR FURNACES

EXPERIENCED RETORT SETTERS SENT TO ALL PARTS OF THE KINGDOM

BLOCKS, LUMPS, AND TILES,
Boiler Seatings, and Flue Covers
Best Glass-House Pot & Crucible Clay.
Please address "MOBBERLEY & PERRY, STOURBRIDGE," as there are other Firms similar in name.

CAST-IRON PIPES, ETC.
THOMAS SPITTLE, LTD.
[ESTABLISHED OVER 50 YEARS.]
CAMBRIAN FOUNDRY, NEWPORT, MON.,
MAKERS OF
CAST-IRON PIPES FOR GAS, WATER, AND STEAM;
ALSO
Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.
ALSO ALL WROUGHT-IRON WORK.
THE LARGEST MAKERS IN WALES.

ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

THE SCHÜLKE REGENERATIVE LAMP

FOR DOMESTIC AND EXTERNAL LIGHTING

The only Generative Lamp employing the common flat-flame burners.

Lamps giving 20-Candle Power consume less than 4-feet of Gas per hour.

A PURE WHITE AND PERFECTLY STEADY LIGHT NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (brackets or suspending). Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP COMPANY, LTD.,

ROOM 446—11, QUEEN VICTORIA ST., LONDON, E.C.,

WHERE PRICE LISTS AND FULL PARTICULARS MAY BE OBTAINED.

JOHN BROTHERTON, LIMITED,

IMPERIAL TUBE WORKS,

WOLVERHAMPTON,

Paris Exhibition 1867.
Amsterdam Exhibition 1883.
Silver Medal and First-Class Certificate
Bronze Medal and Special Diploma
Adelaide Exhibition 1887.
First Order of Merit and Medal.

MANUFACTURERS OF

WELDED IRON TUBES AND FITTINGS

FOR GAS, STEAM, WATER, &c.

LAP-WELDED TUBES

FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS, AND OTHER PURPOSES.

HYDRAULIC AND HOT-WATER TUBES.

COILS OF ALL SIZES AND SHAPES.

Stocks, Taps, Dies, Taper Telegraph Poles, &c., &c.

Paris Exhibition 1867.
Calcutta Exhibition 1883 *and* 1884.
Silver Medal and First-Class Certificate.

London Offices: 3, Jeffrey Square, St. Mary Axe, E.C.

Telegraphic Address: "BROTHERTON, WOLVERHAMPTON."

MELDRUM BROTHERS

STEAM-JET ENGINEERS,

26, Half Street, MANCHESTER,

Telegrams: "MELDRUM MANCHESTER."

MAKERS OF

Gas Exhausters with Automatic Governor working on Steam Spindle; entirely self-acting.

Revivifying Blowers and Exhausters, for continuous or intermittent use.

Compressors to 10 lbs. per square inch and upwards; for Agitating, Mixing, Oxidizing, Elevating, &c.

Ejectors for vacuum up to 26 inches mercury.

Ventilators.

Furnace Blowers for burning coke refuse and other small fuel, for Gas Producers, Re-heating Furnaces, Plus Pressure Furnaces in Chemical Works, &c., &c.

Blowers for testing with air Gasholders, Station Meters, &c.

Elevators for Acids, Gas Liquor, Water, &c.

Boiling Jets for heating liquids with Live or Exhaust Steam.

Apparatus for Acid and Corrosive Vapours and Liquids.

Most of the Appliances named may be seen in operation at the above address, by appointment.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **140** MACHINES AT WORK.

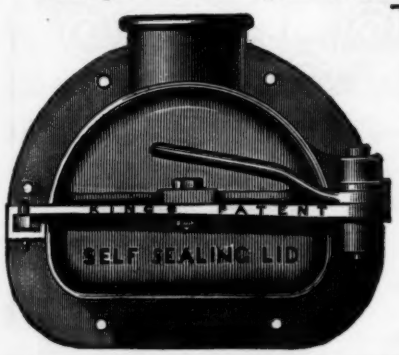
ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE** per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or ⌂-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



Sole Makers of **CIRCULAR, OVAL,** or ⌂-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and as the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

MAKERS OF THOMAS AND SOMERVILLE'S COKE-BREAKING MACHINE.

SOLE MAKERS OF WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

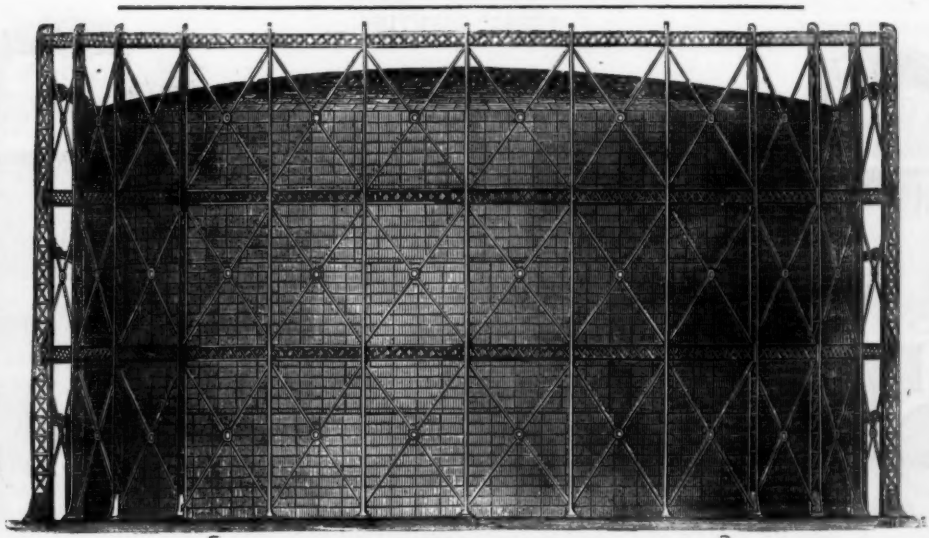
W. C. HOLMES & CO.,

ENGINEERS & CONTRACTORS FOR GAS-WORKS,

WHITESTONE IRON-WORKS, HUDDERSFIELD,

And 80, CANNON STREET, LONDON, E.C.

GASHOLDERS OF **Improved Construction.**



Tar, Sulphate, Muriate, AND **Liquid Ammonia Plants.**

MAKERS OF

IMPROVED CONDENSERS, SCRUBBERS, AND WASHERS;

PURIFIERS with PLANED JOINTS; CENTRE-VALVES TO WORK ALL FOUR PURIFIERS; EXHAUSTERS,

AND ALL APPARATUS and FITTINGS used in GAS MANUFACTURE.

HUNT'S PATENT SUN-BURNER VENTILATING CEILING LIGHT.

This new Ventilating Ceiling-Light has been designed to meet a long-felt requirement—namely, greater economy and effectiveness, combined with the convenience and adaptability of the ordinary Sun-Burner. The combination of hexagonal reflectors by which it is formed, affords a very large reflecting surface, and their arrangement admits of the employment in a vertical position of the best known types of flat-flame burners; by which means an exceedingly brilliant, steady, and satisfactory lighting is secured. It can be supplied of any desired power, from a consumption of 50 or 60 cubic feet per hour to one of 1200 cubic feet per hour, and is suitable for lighting large Offices, Banks, Churches, Chapels, Theatres, and other Public Buildings. It is reasonable in its first cost, and economical in gas consumption in comparison with the light afforded.

These Sun-Burners are now fixed in the following towns:—

AYLESBURY	2
ASTON MANOR	2
BIRMINGHAM	13
BRECON	4
COVENTRY	1
HANLEY	1
LEEK	2
NEWCASTLE-ON-TYNE	3
NEWCASTLE-UNDER-LYME	4
OLDBURY	2
REDDITCH	1
STOURBRIDGE	9
SOUTHPORT	5
ST. ALBANS	2
WOLVERHAMPTON	6
WEDNESBURY	2
YOKOHAMA	1

Numerous References and Testimonials upon application with Prices.

ORDINARY METER.

Wet & Dry Gas-Meters.

HUNT'S PATENT COMPENSATING GAS-METER.

Station Meters & Governors.

OFFICIAL TEST-METERS.

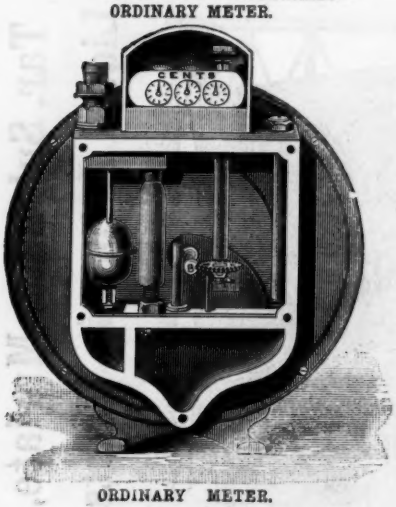
LAMP METERS & GOVERNORS.

TEST HOLDERS.

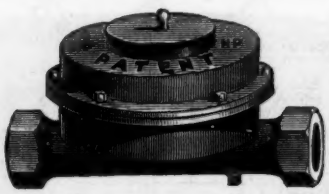
PRESSURE-GAUGES.

LAMPS AND EVERY REQUISITE FOR PUBLIC LIGHTING.

DRY METER.



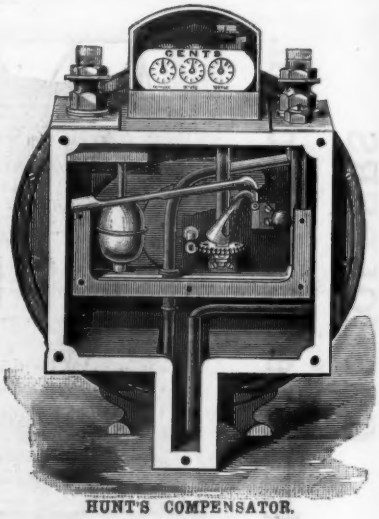
ORDINARY METER.



BRADBEAR'S IMPROVED PATENT GAS-ENGINE GOVERNOR,

Which effectually prevents Oscillation of Gas in Mains supplying Gas-Engines.

PRICES & TESTIMONIALS ON APPLICATION.



HUNT'S COMPENSATOR.

JOHN BENT & SON,

BELL BARN ROAD, BIRMINGHAM,

Telegraphic Address: "GASMETERS, BIRMINGHAM." **ESTABLISHED 1830.**

LIVESEY AND TANNER'S

PATENT

DIFFERENTIAL TAR AND LIQUOR OVERFLOWS

AND

TAR SCREEN

FOR HYDRAULIC MAINS.

This Apparatus is being successfully used at many Works; amongst others, at all the Stations of the South Metropolitan Gas Company, and at the Silvertown Works of The Gaslight and Coke Company, besides large Provincial Works.

Amongst other commendatory letters, the following have been received:—

Croydon Commercial Gas and Coke Company,
May 29, 1888.

Messrs. S. CUTLER & SONS,

GENTLEMEN,—In answer to your letter of the 26th inst., I am pleased to be able to say that I am so satisfied with the LIVESEY AND TANNER TAR OVERFLOWS which I have had in use during the past winter, that I have recommended their adoption throughout our retort-houses.

I am, yours faithfully, J. W. HELPS.

Gas-Works, Tunbridge Wells,
May 30, 1888.

Messrs. S. CUTLER & SONS,

GENTLEMEN,—I have much pleasure in saying that LIVESEY AND TANNER'S TAR AND LIQUOR OVERFLOWS, which have been fitted to all our Hydraulic Mains, have given me complete satisfaction.

The use of New Boghead Cannel has been reduced from 2·72 per cent. to 0·10 per cent.; and at the same time the illuminating power has been increased by a quarter of a candle, when working under precisely the same conditions in other respects.

I have also adopted them in a small works, to which I consider they are equally suited, as they work freely, and require very little attention.—Yours faithfully,

ANDREW DOUGALL, Jun., Assoc. M. Inst. C.E.

Gas-Works, Tunbridge Wells,
Feb. 15, 1889.

Messrs. S. CUTLER & SONS,

GENTLEMEN,—In reply to your inquiry respecting LIVESEY AND TANNER'S TAR AND LIQUOR OVERFLOWS, I have much pleasure in saying that they continue to give every satisfaction.

A few months ago I had a very striking proof of their value. I started four Beds without the "Overflows," allowing the Tar to travel along with the Gas, when the illuminating power dropped a candle, and did not regain the loss until the "Overflows" had been put into operation. This experiment was repeated with the same result.

The apparatus requires but little attention; and if a small quantity of tar is run off regularly every morning, nothing further is required.—Yours faithfully,

ANDREW DOUGALL, Jun., Assoc. M. Inst. C.E.

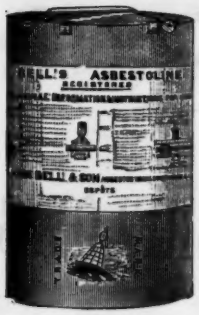
S. CUTLER & SONS,

PROVIDENCE IRON-WORKS,

MILLWALL (near Steamboat Pier), LONDON, E.

BELL'S ASBESTOLINE.

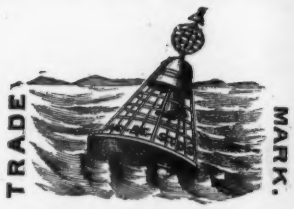
REGISTERED.



All kegs are labelled as above.

ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

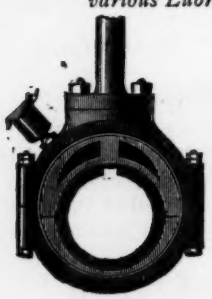
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 6000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

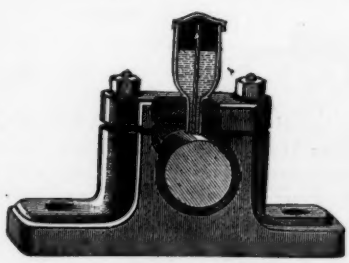
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

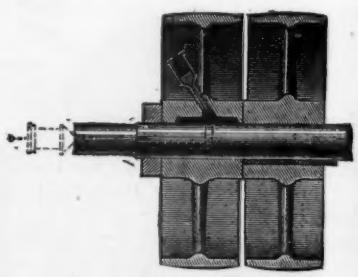
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point** is so high that it **lies beyond the range of Mercurial Thermometers**; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

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BELL'S ASBESTOS DAGGER PACKING

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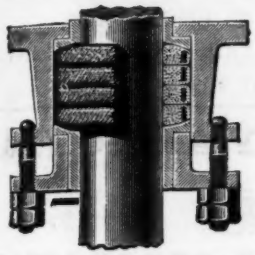

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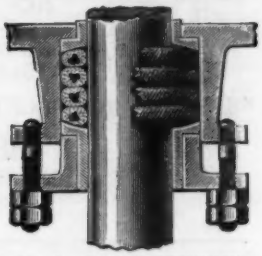

Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT, DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest type. The Packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

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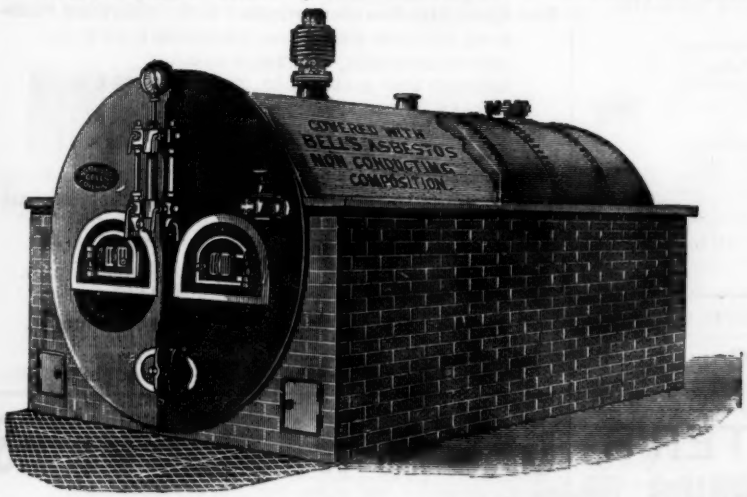
Will reduce loss by radiation to a minimum and save 40 per cent. of fuel.



Price 25s. per Cwt.

Second Quality, 15s. per Cwt., is superior to the best sold by other Firms.

It is essential in covering that it shall not only be a non-conductor, but a substance free from whatever can injure metal, and of a nature which will enable it to adhere well for years. To do this it must be sufficiently elastic to prevent cracking and leaving, by expansion and contraction, the heated surfaces to which it is applied. This Composition is daily applied to Tanks with Round or Flat Bottoms, and its adhesive properties enable it to keep to the surfaces without bands or any device necessary for holding on other compositions. Our covering never fails to Save its Cost in a few months, lasts for years, after which it can be taken off and applied again with a little fresh. In all respects it is so superior as to be infinitely cheaper than Compositions sold at one-fourth the price. We would point out that this, being supplied dry in bag, will cover six times more surface than other materials which are sent out wet in cask. This shows the apparent low prices of other Compositions to be a sham.

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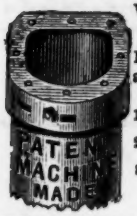

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Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

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AN ACKNOWLEDGED SUCCESS. HAS STOOD THE TEST OF TEN YEARS.
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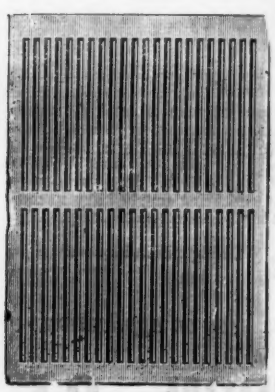

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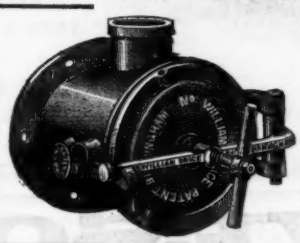

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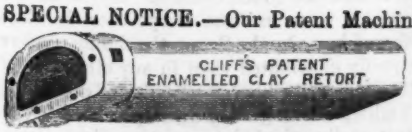

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This Lid and Fastener is specially designed for taking up the wear and tear caused by refacing the Mouthpiece and Lid, hitherto in a large measure overlooked; and, in addition, from the special way in which the Lid is attached to the Cross-bar, the Lid has free action, and thus secures a more uniform scrape over the whole surface when being forced home by the Screw, the closing pressure being much more equally distributed than in any other form of fastening. The Lid itself is well ribbed, internally and externally; thus securing the Tightest, Strongest, and Simplest Lid in the Market, and the most easily adapted to existing Mouthpieces. The Cross-bar being of steel, it is not liable to be strained, and there is no Eccentric to wear and become inoperative.

"In answer to your inquiry as to Ruscoe's Patent Retort-Lids, we beg to say that we have used them in several works, and are thoroughly satisfied with their action. We consider they are the best in the market.—G. W. STEVENSON & SON."

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London: Printed by Walter King (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, March 5, 1889.